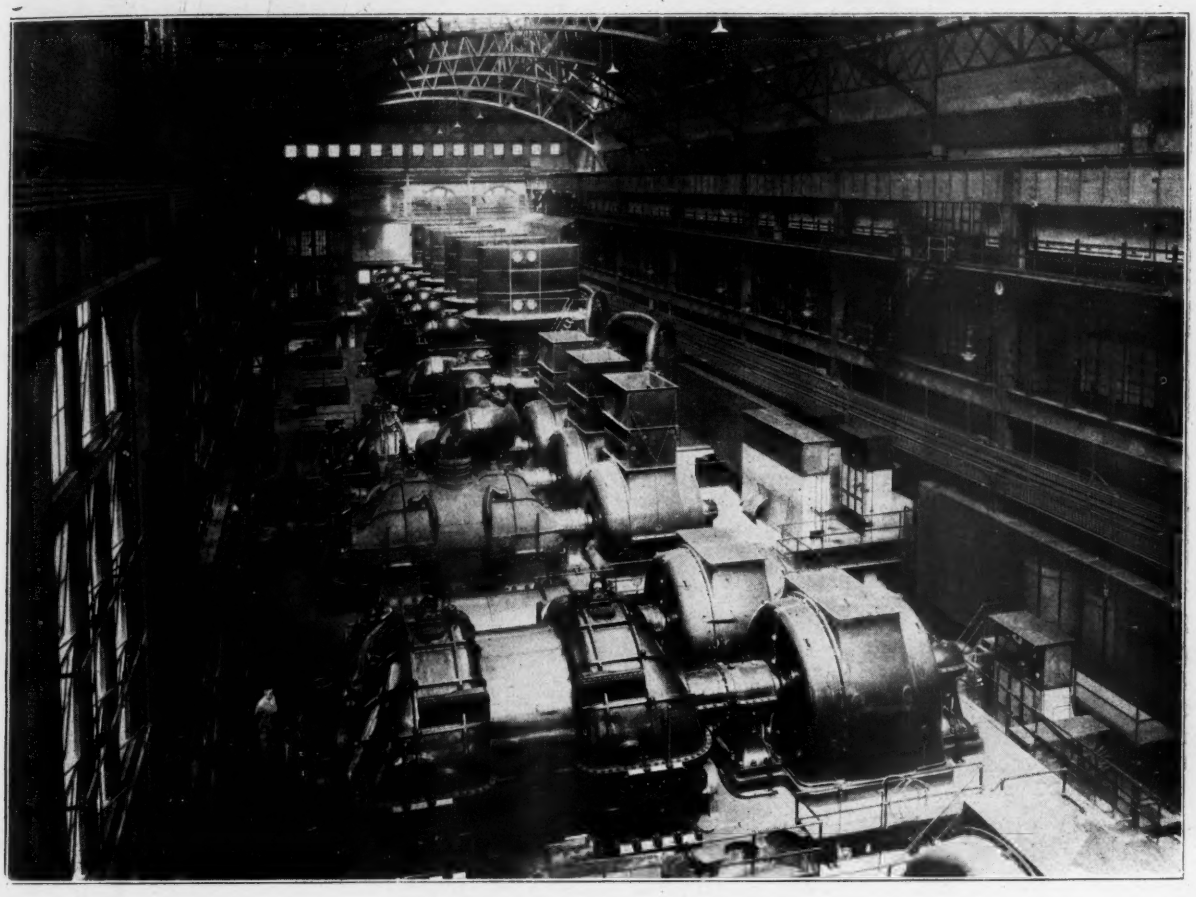
# Electrical Review

WITH WHICH IS CONSOLIDATED WESTERN ELECTRICIAN AND ELECTROCRAFT

VOL. 76—No. 1. CHICAGO, SATURDAY, JANUARY 3, 1920.





# A Review of Developments in the Electrical Industry in 1919

## Industry Recovers Quickly from Shock of Readjustment—Central-Station Companies Resume Normal Business Basis Early in Year and Show Good Gains—All Elements of Industry, Except Electric Railways, Busy and Prosperous—Record Demand for Appliances

By AINSLIE A. GRAY

A condition of unusual emergency during 1918 forced the development of electrical enterprises at such a rate of acceleration that the beginning of 1919 found the industry many milestones ahead of where it would have been in a more orderly progress of events. Because of exhaustion of stocks, with the world clamoring for electrical supplies, and with organizations keyed to a fine pitch in efficiency, the road was wide open for a continuation under the readjustment to a peace basis of the prosperity that had attended the industry's war-time efforts. Electrical exports maintained considerable gains over a year ago, the figures for the nine months ending September, 1919, showing a total of $68,439,204, against $43,756,901 for the same period in 1918, a gain of about 55%.

Electrical service in 1918 brought about a greater appreciation of its advantages than had ever been realized before. The beneficent and

economic possibilities of correct lighting and intelligent motorization for ameliorating dissatisfaction with working conditions and for stimulating production without debasing the morale of the workers gained rapid and ungrudging appreciation. Thus what ground was won under the whip and spur of necessity was held because of the benevolent influences the conquest had made manifest.

## CENTRAL-STATION DEVELOPMENTS.

*Expansion of Production of Energy for Light and Power—Victory Convention of the National Electric Light Association—Early Resumption of Normal Strides—Large Issues of Securities—Extensive Interconnections and Additional Station Capacity—The Coal Strike—Repeal of Daylight Saving Act.*

Flushed with the consciousness of having overcome a series of unusual difficulties and emerging gloriously from a season of sacrifice and service, the central-station industry entered the new year tuned to a pitch of high endeavor. Rehabilitation, replacements and extensions were to be the order of the day. Absorption of large amounts of station capacity, directed to unusual loads for war purposes, and the unknown factor represented by international readjustments and their possible effect upon the prosperity and progress of the country, however, indicated caution, and, therefore, enthusiasm became tinctured with the essence of conservatism.

It has been estimated that transformer capacity amounting to 2,120,000 kilowatts was devoted to war industries in 1918. This was a small part, it is true, of the total connected load all over the country, but it presents a problem in connection with the development of new markets.

### Victory Convention of N. E. L. A.

Early in 1919 plans were projected for the full resumption of all normal activities of the National Electric Light Association. Arrangements were quickly made for a "Victory" convention at Atlantic City in May and from every department of the electrical industry there was drawn the unstinted support that made this gathering significant of a great industry once more in full swing. In point of numbers in attendance, amount of real business transacted and resumption of optimism for the present and future, this convention went far beyond anything before then achieved. And so great was the response of the manufacturers to the impulse of co-operation that exhibits doubled the representation of any previous occasion.

### Favorable Progress Made.

Analysis of operating reports showed that in practically every locality central stations not only diverted their great war loads to other useful purposes but were on a basis of substantial gain both in connected load and revenues early in the year. An interesting commentary upon the foregoing is found in the fact that at the end of 1918 46 of the largest generating companies in the United States and Canada having yearly outputs in excess of 100,000,000 kw-hrs., had a combined output of more than 25,000,000,000 kw-hrs., of which 4,500,000,000 kw-hrs. represented the output of companies in Canada. The increase in output for 1918 represented approximately 4,000,000,000 kw-hrs. for the 46 companies.

### New Securities.

Despite an unfavorable investment situation, the Victory Loan, current high rates for money and the disposition of the utilities not to burden their operations any more heavily than absolutely necessary for new equipment and betterments to meet public demand, the number and value of new securities issued reached a high mark and indicated that the credit of this class of electric utilities ranks high in even a critical market.

As early as March, information available showed that 50 public service companies had put out new stocks or bonds to the amount of $110,000,000. While some of the electric utilities are joined with other utilities, most of these capital issues were for the development of electrical systems. Furthermore, these issues, representing but a small part of the total new investment required, are significant of the sums that will be needed for ultimate developments. The readiness of the investment market to absorb these offerings even under adverse conditions lends hope to the thought that money for these betterments will be forthcoming.

### Extensions, Interconnections and New Stations.

Extensions, interconnections and new stations are the results of years of consideration. What appears to be an accomplished fact today had its beginnings years ago and those developments begun during 1919 will in many cases entail years of effort before they become a factor in the production of electrical energy for light and power. However, there have been revealed in 1919 some conspicuous examples of the constant expansion that is going on in central-station development.

Early in the year the Hydro-Electric Power Commission of Ontario added from 40,000 to 50,000 hp. to its Niagara Falls plant. Although this work was started in March, 1918, to supplement the existing facilities of the plant for war work and the emergency had ceased to exist prior to the completion of the installation, the large number of new industries attracted has already appropriated a large part of the additional output.

The Narragansett Electric Light Co. put into operation at Providence, R. I., a 45,000-kw. turbogenerator unit. The Appalachian Power Co. started up a 20,000-kw. steam station at Glen Lyn, Va., supplementing its hydroelectric plants for the development of a rich mining district in Virginia, West Virginia and North Carolina.

The Philadelphia Electric Co., in order to take care of the tremendous war burden imposed upon it, and which was expected to reach a total of 620,000 hp. at the end of 1918, had planned a maximum extension. The signing of the armistice made necessary a curtailment of these plans, but the company carried to completion a part of its program. Similarly, the Baltimore Consolidated Gas, Electric Light & Power Co., the Pennsylvania Water Power Co., the

Public Service Electric Co. of New Jersey, the New York Edison, Brooklyn Edison, New York & Queens, Westchester Lighting and United Electric companies, although curtailing plans, carried to completion the partial developments inaugurated, and progressed in securing for operation and their customers the advantages of further studies and accomplishments in interconnecting.

At Niagara Falls, in the Pittsburgh district, throughout New England, in the South, all through the Middle Atlantic states, and in the Middle West the same sturdy determination carried to completion the partial development of magnificent plans inspired by the war's emergency. And it is a happy commentary that in practically every instance what the central station had won out of the emergency in increased output it held in the rapid development of tributary industries and the sane allocation and control of its diversity-factors.

In the Pacific Coast and Rocky Mountain states the growth has been more rational and in response to the logical increase in public demand for energy for light and power. Financing has been arranged and several important projects are under way. The San Joaquin Light & Power Co., the City of San Francisco, Calif., the Great Western Power Co., and the Southern California Edison Co. have the most important developments in hand. The last-named involves construction to cost $16,000,000.

### The Coal Strike—Water Power—Daylight Saving Repealed.

Toward the end of the year the coal strike tied up industry to some extent and brought back to some communities the war experiences of lightless nights, curtailed production and suspension of transportation. Central-station companies were again to the fore in conserving fuel supplies and fine organization spirit and patriotism were once more exemplified in the many practical efforts made toward the mitigating of unfortunate conditions which ensued.

Contrary to hope and expectation, the year closed without result as far as definite legislation with regard to a policy of water-power development is concerned. Some progress, however, has been made by reason of favorable consideration by both branches of Congress, and probably final action will be forthcoming soon after the holiday recess..

With the President vigorously opposing the repeal of the Daylight Saving Act, both Houses of Congress passed the bill over the Presidential veto, and the clocks of the nation were readjusted, apparently on a permanent basis, on the last Sunday of last October.

## PRIME MOVERS AND OTHER CENTRAL-STATION EQUIPMENT.

*Large Turbogenerators—A Mammoth Waterwheel—Station and Line Protection—Distribution at High Voltages and Outdoor Substations.*

Closely akin to central-station progress is the development of station equipment. While there have been no startling developments or inventions of a revolutionary nature, the year marks the advent of some super-equipment and, in the matter of transmission, a bid for serious consideration of higher voltages than heretofore believed practical.

While not strictly for central-station service, the installation at the 74th street plant of the Interborough Rapid Transit Co., New York City, of a 60,000-kw. turbogenerator unit is of keen interest. The unit has a two-hour rating of 70,000 kw.; it has one high-pressure and two low-pressure elements and is the first triple cross-compound turbine to be placed in operation. It occupies a floor space of 52 by 50 ft. and is 19 ft. high. Each element drives, at 1500 r.p.m., a generator rated at 20,000 kw. continuously, 23,500 kw. for two hours, and 30,000 kw. for a half hour. This unit is the largest prime mover in the world.

Recent authoritative opinion states that there is nothing to warrant undue concern with regard to the operation of large turbines. In the 74th street station of the Interborough Rapid Transit Co. there is a maximum installed rating of 190,000 kw., and in the 59th street station 210,000 kw. These stations operate in parallel.

The tendency is gradually to adopt higher steam pressures and temperatures, experience proving at Joliet and a few other large stations where pressures around 300 lbs. are employed that the prophesied troubles were more anticipated than real. This movement is going on gradually on the part of the plant operators and the boiler builders, so that their conservatism bodes well for the eventual goal. Mechanical stokers during the year have found increasing use, the expenditure on stokers alone during the year running at about $10,000,000. Boiler settings are being built higher and furnace chambers larger so as to permit higher rates of combustion and evaporation without adding needlessly to stack temperatures. In at least one instance some very large boilers are now being installed for operation normally at 250% of rating.

Boiler-room instruments have gained enormously in popularity, and also in accuracy. The steam-flow meter, the $CO_2$ recorder and the stack thermometer are now being used to supplement the draft gages and the Orsat. Payment of the boiler-room force upon a bonus system is being used with good success in a number of notable instances.

Pulverized coal has been advocated, and several central stations are carrying on experiments with apparent success. Colloidal fuel, which is a fuel composed of crude oil and small particles of coal, made its appearance during the year and while it opens up vast possibilities for marine service is deserving of attention by stationary plants located where coal dust, etc., is plentiful. Oil as fuel for central stations has received great impetus and its use upon an increasing scale is to be expected, especially for peak-load service, etc.

Air-washers for limiting the amount of dirt and oil admitted to generators, additional insulation on armature coils, and the installation of permanent fire-extinguishing provisions have materially reduced the fire hazard in large generators. Many heavy power generators are now

equipped with permanent steam or water fire-extinguishing equipment. Special efforts are being made to improve the dependability of these large generating sets on both the steam and electrical ends. Balanced-relay protection has been adopted as standard on new generator installations and where installation expense is not too great this protection is being added to old equipment.

A 5000-kv-a., 100,000-volt air-break switch has been designed and has successfully interrupted the charging current of 100 miles of transmission line. The outdoor substation is without competition for high voltage with small as well as large capacities.

The use of protective relays for the safeguarding of networks of distribution is receiving especial study.

The desirability of bringing large amounts of electric power from coal mines and water-power stations to industrial centers has again brought up the question of higher voltages for transmission and an elaborate study has been presented indicating 220,000 volts as the logical voltage for such high-capacity, long-distance transmission. Such a high-tension network is seriously proposed in California.

The Niagara Falls Power Co. has ordered three waterwheel generators each rated at 32,500 kv-a., 25 cycles and 12,000 volts. These are the largest units ever designed for water-power plants.

## ELECTRICAL ILLUMINATION.

*Tungsten Lamps Dominate Market—The New White Mazda—A New Neon Lamp—Improvement in Arc Electrodes—Correct Industrial Illumination to the Front —Revived Interest in All Lighting.*

Tungsten lamps now strongly predominate in electrical illumination and most of the development in lighting accessory equipment has consequently been along lines to conform. Carbon-filament lamps persist to an almost negligible degree. Miniature tungsten lamps have made surprising gains. Motion-picture work has received especial attention and two tungsten lamps of special construction have now been standardized for this service.

The 50-watt White Mazda, with its beautiful lines, pleasing appearance and tipless bulb, has leaped into instantaneous popularity, and the 25 and 50-watt mill type Mazdas, two newcomers, have also become popular because of their ruggedness.

New types of vapor lamps are reported, particularly in the form of an improved neon lamp. A new arc of considerable promise is being developed for picture projection. Much headway is being made in searchlight development and locomotive headlights show much attention with resulting betterments.

The importance of correct illumination as a beneficent and economic factor in industry has continued to receive recognition, several states having been added during the year to the quota already on record as having adopted factory lighting codes. Coincident with the development of high-intensity incandescent lamps, manufacturers of reflectors have devised new accessory equipment to utilize to the greatest advantage these sources of illumination without objectionable glare. Notable examples are the development of diffusing mediums, the new gas and vaporproof unit and the luminous-top dome reflector. Self-cleaning units are now available.

For street lighting, an important addition is the combination of a dome refractor and a stippled or rippled outer globe. A new form of bowl refractor with a closed diffusing base is being brought out. In ornamental street lighting the tendency is toward single units of high candlepower. Luminous-arc electrodes are being improved by being made under heavier pressure, thus resulting in considerable gains in efficiency.

Revival of interest in lighting was shown by the large attendance, comprehensive program and lively discussion at the annual convention of the Illuminating Engineering Society, held in Chicago last October. Not only illuminating engineers and manufacturers of lamps and lighting equipment were represented, but many lighting companies, state and other governmental authorities, architects and others having to do with lighting. The war's restrictions on lighting have left no permanent impress. If anything, the reverse is true. Removal of the similar restrictions after the recent coal crisis showed the widespread appreciation of the value of abundant illumination.

## ELECTROCHEMISTRY AND ELECTRO-METALLURGY.

*Electric Furnace Developments Large—Electrical Equipment for Heat-Treating Makes Favorable Impression and Gains Large Application—Electric Welding Receives Impetus.*

Electrolytic reduction of copper ores developed to probably the greatest extent, with extraction of zinc and the manufacture of chlorine compounds running next in order in the use of electrical recovery processes during 1919. The electrical reduction of aluminum and manufacture of nitrates also grew in volume, great impetus having been given to these processes by the development of methods and equipment to make up for shortage of production abroad.

It is in electrothermal industries that the greatest developments have occurred during the past year. This, however, has not been so much a matter of advance in design as it has been one of application of well-known types. There have been numerous applications of electric furnaces for brass-melting work. In electric melting and refining of steel there has been a great awakening. Ten years ago the production of electric steel was just beginning. The total product was less than 0.1% of the total steel produced. In 1918 the output of electric steel furnaces ran to more than 800,000 tons. Ten years ago there was manufactured more than eight times as much crucible steel as electric steel. In 1918 the ratio was more than four to one in favor of the electric product. Figures are not available for the exact volume of electric steel made during 1919, but there are not less than 300 electric furnaces in operation in the country and the output is undoubtedly greater than even the most sanguine would have estimated.

However, the great stir in the electrothermal

industry has not been with regard to melting and refining furnaces, but centers around electrical heat-treating equipment. Electric furnaces for soaking pits, heating blooms and billets, annealing bars and sheets and heat-treating drop forgings, castings, rails, etc., have come into vogue. Core-baking ovens have been successfully installed and operated, and japanning ovens have been used much more widely.

Though not so strictly a part of the metal industry, another electrothermal process which received its great impetus through pressure of war construction, electric welding, has not only maintained its newly-won prestige but has gone ahead during 1919 with remarkable strides. Probably no other new industry has so quickly accumulated such an amount of data or attracted so much attention from keen minds.

It is in these main directions that electrochemistry and electrometallurgy have developed in 1919. Application has come so fast and been so widespread that time must elapse before a comprehensive record can be made up.

## DEVELOPMENT IN ELECTRIC TRANSPORTATION.

*Little New Acomplished in Main-Line Electrification —Sad Status of Electric Railways—A New Electric Vehicle.*

Main-line electrification, with the exception of the work of the Chicago, Milwaukee & St. Paul Railway in completing its electrification from Othello, Wash., to Seattle and Tacoma, a distance of some 200 miles, thus bringing the total electrified portion up to 660 miles, was a more or less dead issue as far as actual accomplishment was concerned during the past year.

The study of the subject has been enriched by the notable contribution of Calvert Townley in a paper before the Boston meeting of the American Institute of Electrical Engineers last March. His is a most sane view of the problem of railway electrification and one that holds out high hope for the future. Other noteworthy contributions to the literature of the subject were also made last year.

Announcement that the railways of Belgium will be electrified at an early date, after a thorough investigation had justified the passing of this decree, and the fact that the Swiss Federal Railway Council had authorized extensive electrification were two bright spots in a year of meager accomplishment. Many projects are receiving consideration in various sections of the world, however, and the advantages of electrification are undoubtedly becoming so widely recognized as to lead to carrying out at least some of these projects this year.

### Electric Railways Have Troublesome Times.

Undoubtedly the most unfortunate of public utilities, the electric railways have continued to have a bad time of it. Wage disputes in many parts of the country have precipitated extensive strikes and the resultant tie-up of facilities has made a bad situation worse. Railway companies, unable to finance extensions out of inadequate earnings and refused permission to increase rates of fare, have, in the face of increased cost of operation, been forced into involuntary insolvency upon an unprecedented scale. In two notable instances, New York City and Toledo, O., tremendous losses have been imposed upon stockholders and in the latter city such an impasse was reached that electrical rail transportation was suspended for many weeks.

So acute has the electric railway situation become, and so intimately does it affect the public that President Wilson appointed the Federal Electric Railway Commission to inquire into the financial problems of the street and other electric railways and to suggest remedies for the financial difficulties by which nearly all companies appear to be confronted.

No permanent solution appears to have been arrived at, but such examination as has been made indicates that, by and large, no matter what extraordinary conditions may have led to popular prejudice and distrust, the present investment of approximately $5,000,000,000 does not exceed the physical values. The roads are suffering for sins of omission and commission of a bygone day, and the disposition appears to be to look with greater tolerance upon the request for higher rates.

It is conceded that fares should be increased to provide adequate revenue either by a flat increase or by a zoning system of increases and decreases that provide a payment for service in proportion to the length of haul.

### Electric Vehicles, Trucks and Tractors.

Almost unobserved, the electric pleasure car continues on its silent way, the volume of sales showing some increase and several new types, of the light-weight, roomy type putting in an appearance.

The Dey type of electric was revived during the summer and plans announced for its development. The idea is to produce a vehicle that will weigh about 1000 lbs. and sell for less than $1000. The motor has both field and armature rotatable, one element connecting with one driving wheel through a pair of reduction gears, while the other element connects in a similar manner to the other wheel. On down grade the motor recharges the battery at a speed as low as three miles per hour, automatically slowing down the speed as the grade becomes steeper. The car is also equipped with a portable charging plant.

Industrial trucks, tractors and trains for intramural and factory transportation have been greatly improved and a large volume of sales and installations have been reported.

## TELEGRAPHY AND TELEPHONY.

*Federal Supervision Relinquished—Property Maintained and Returned in Good Physical Condition—Progress Under Federal Control—Radiotelegraphy and Telephony.*

Federal supervision of telegraph and telephone lines was relinquished on August 1. During the period of Federal control the work of development and research made gratifying progress and many notable advances in construction, equipment and methods were brought to completion. Property was maintained and returned in good physical condition.

The amount of copper needed for a long-distance telephone circuit has been reduced to a small fraction of the weight formerly required. Simultaneous conversations may be imposed upon a single circuit, and at the same time the circuit may be used for telegraphic transmission many times in amount that formerly transmitted over a single telegraph wire. The possibilities of long-line transmission through circuits in underground cables have also been increased.

Automatic machine switching is fast coming into use and will greatly relieve tension by taking up a considerable part of the growth in telephone service. The difficulties in getting and keeping enough operators are causing the leading telephone companies to turn to automatic telephony and a great extension of the "girlless" 'phone is to be anticipated.

In wireless telegraphy and telephony the outstanding feature of the year has been the revealing of the great advances made in connection with the conduct of the war. Under favorable conditions radio communication is now an accomplished fact over practically unlimited distances. Development of every branch of radio service has received a great impetus. The work of Alexanderson and others has been acclaimed. At the close of the year new successful experiments on the "wired wireless" system of Major General Squier were announced. The amateur and pseudo-scientist is again in full swing, with the lifting of the ban on private stations. Demand for wireless equipment shows remarkable increases.

It is now known that wireless telegraphy and telephony played a large part in the transmission of vital information during the closing days of the war and was also used to great advantage in connection with the Paris peace conference and in maintaining communication with President Wilson upon both of his trips to Europe while on the high seas.

The most recent authentic information, the records of the Bureau of Navigation of the Navy Department, shows that on June 30, 1918, there were in operation 134 commercial shore stations and 833 commercial ship stations. Of the shore stations, 97 were in continental United States, 28 in Alaska, 8 in Hawaii, and 1 in Porto Rico.

The Government has erected wireless plants at various points along the Atlantic and Pacific coasts and at Pearl Harbor, Hawaii, and at Cavite in the Philippines. There were 135 Government shore stations on June 30, 1918, 88 in continental United States, 20 in Alaska, 19 in the Philippine Islands, 3 in the Canal Zone, 2 in Hawaii, and 1 each in Porto Rico, Guam and Samoa. Government ship stations totaled 470. This latter number has been greatly increased.

At Arlington, Va., the station is in regular communication with the station at Chollas Heights, near San Diego, Cal. Direct communication with the Italian Government station at Rome has also been established. Messages are transmitted between Arlington and the Philippines through San Diego, Cal., and Pearl Harbor, Hawaii. Communication can also be had between Pearl Harbor and Sayville, N. Y. Under favorable conditions Arlington can even communicate directly with the Pearl Harbor station.

## ELECTRICAL HOUSEHOLD AND INDUSTRIAL APPLIANCES.

*Households Turn to Electric Washers, Cleaners and Other Electrical Appliances as Relief from Servant Problem—Extraordinary Volume of Appliance Sales Leads to Opening of Many New Electric Shops—Heavy Demand for Small Motors.*

Underproduction, both in the home and in industry, has contributed to a most remarkable demand for electrical appliances of every description. The homekeeper, for instance, in the effort to discount either poor help in the housekeeping routine or to compensate for no help at all, has been forced to cast about for mechanical assistance. In the emergency electrical appliances, heating devices and motor-driven equipment have been absorbed in almost unbelievable quantities.

Vacuum cleaners, washing machines and flatirons have been at a premium during a greater part of the year. Other laundry equipment, dishwashers and sundry appliances, such as toasters, grills, hot plates, disk stoves, percolators and heating pads, have all had a heavy run. Electric fans made record-breaking sales.

Similarly, in the commercial line, electric bakeries have grown and multiplied. Vacuum cleaners of the portable and stationary types have been in great demand. In the industries glue kettles, drying ovens and myriad other devices have been called for to meet conditions caused by unrest and shortening of hours of working and letdown in productive capacity.

Appliance stores have sprung up by the hundreds, contractor-dealers have expanded retail facilities, central stations have augmented their electric shops. Department stores, house furnishing stores and hardware dealers have added materially to their lines of electrical merchandise.

### Industrial Motor Equipment.

For a brief period, early in the year, the motor market was quiet and the opinion prevailed that the release of motor equipment from munitions and other war work would flood the market with second-hand equipment.

Motor stocks were in ragged condition at the beginning of the year, anything over 100 hp. being difficult to secure within any reasonable time.

Contrary to expectations, comparatively few motors were stocked and those that were were readily absorbed. An amazing demand developed for motors of every variety and in the smaller sizes manufacturers have with difficulty met their orders. In fact, many of the leading lines have been short of many sizes under 50 hp. for months.

The steel industry has absorbed a huge volume of motor equipment, with textile mills and woodworking establishments creating new records for installation activity.

## WHAT OF THE FUTURE?

*Prospects Indicated by Activities of Leading Organizations of the Industry, Which Are All Planning for a Bigger Future Than Ever—Some Directions in Which the Leading Developments May Be Expected.*

Were one forecasting for the distant future of electricity, the task would be one of relative

simplicity. He would merely saturate his consciousness with the record of the achievements of the past, let his imagination run riot and arrive at a picture that would undoubtedly then fall short of what will be the realization of those of us of this generation.

However, while we are, indeed, concerned with things far in the future, and by our work of today may leave some indelible traces upon the history of the industry, our pressing and immediate concern has to do with what is just before us.

The condition of an industry, insofar as its immediate prospects for good or ill are evident, is reflected in the activity and influence of its constituent organizations.

The electrical industry has always attracted to its service devotees of the finer sort. The subtlety of the scientific problems involved, the grave responsibilities incurred in the design and application of its machinery and equipment, the very nature of electricity—something to be loved and feared, a servant of herculean proportions, yet susceptible to being reduced in potency to forces of infinite minuteness, and never to be wholly understood and always treated with respect—has always been a part of the industry itself.

So the best of men have foregathered to make up the elements of the many organizations within the industry. And throughout the year we have seen in the gatherings of various electrical associations many exemplifications of the best traditions of the industry. It is in the hands of the leaders in the industry that the future lies and a brief review of their activities in the year just closed is of interest in indicating the prospect for the immediate future.

The American Institute of Electrical Engineers has embarked upon an ambitious program. In order to make the Institute of the greatest good to the greatest number, the effort will be made to build up the local sections through more direct contact with the national officers, so that even those remotely situated may be kept in more intimate touch with the progress made in the centers of fullest development and engineering activity.

The National Electric Light Association is attacking in the broadest way the scientific and commercial problems which meet the central station at every turn, and going far afield is seeking to establish cordial and co-operative relations with every other element in the industry. This year will witness the holding of the annual convention on the Pacific Coast, a tribute to the great work in electrification going on there and an indication that the mind of the central-station man is national in its scope. Special attention is being given to organizing geographical sections.

The Illuminating Engineering Society goes on to greater things and this year more than ever before will undertake special educational efforts to present to those concerned with the design, installation and operation of lighting systems a clear conception of the principles of illumination so that they may provide intelligently for really good lighting. Similar efforts will be made to develop a much wider appreciation of good lighting on the part of the general public.

The Electrical Manufacturers' Club, the Electric Power Club and the Associated Manufacturers of Electrical Supplies were all intensively active during the year, their chief concern being the development of standards in practice that would enable the industry to better serve the public.

The Electrical Supply Jobbers' Association held a number of important meetings, the discussion in the main bearing on the problem of economic distribution as revealed through studies of the best methods of purchasing, warehousing, marketing and merchandising. Open meetings prevailed and the meeting at Cleveland recently, the largest in the history of the Association, when resolutions were adopted recommending the separation of jobbing and retail businesses, indicated the long way we have come in an effort to establish real mutuality and co-operation. The Electrical Supply Jobbers' Association also will hold its annual meeting on the Pacific Coast this year, where so much has been accomplished in the merchandising of electrical supplies and out of which has come much of the inspiration for a closer affiliation in mutual interest upon the part of the various element in the entire electrical industry.

The National Association of Electrical Contractors and Dealers has organized the Bureau of Education and Research, decentralized its effort and will launch a mighty endeavor to rapidly bring into commercial usefulness the latent ability of the electrical contractor and dealer in coping with the growing demand for merchandising outlets in direct contact with the ultimate consumer.

The Society for Electrical Development, strengthened through the accession of new memberships among manufacturers, central stations, electrical supply jobbers, contractors and dealers, is planning to carry the message of electricity throughout the land on a bigger scale than ever before and to help co-ordinate the efforts of all these essential elements of the industry.

And so the story might be run of the activities of all of the many organizations, national and state, devoted to every branch of the industry. Underlying them all and significant of all is a hardy optimism that requires and expects big things of the future. Knowing definitely the laws upon which accomplishments have been based, well informed with regard to the opportunities directly ahead, alert and self-confident, the organizations within the industry are ready for the future.

Of the larger issues, the beginnings of which have already been made and to the solving of which this year's work will contribute an important item, the development of water powers, establishment of mouth-of-the-mine power plants, super-power-transmission lines and interlinked networks of distribution occupy the foreground.

Applications of electrolytic and electrothermal processes planned for the immediate future are greater than the total now existing. These include the electrolytic reduction of copper and zinc ores and the extraction of precious metals. Manufacture of chlorine compounds and nitrate products occupy a large part of the industrial electrochemical program. The electric steel furnace is being, and will continue to be, rapidly

adapted for melting and refining and a large advance is looked for in applications for heat-treating of various kinds. What is true of the steel furnace is true of the brass-melting furnace.

The railways of the country go back to private ownership on March 1. Of the six billion dollars estimated as necessary for rehabilitation and new equipment, a large part will be spent directly for electrical material.

The metal industry, in addition to its requirements for reduction of raw materials and heat-treating of semifinished products, will absorb a tremendous amount of generator and motor equipment in enlargements under way. The textile and woodworking industries are planning big extensions.

All of this development is predicated upon the use of electrical energy from community central stations or from power plants integrally a part of manufacturing plants. To this extent efficiency of power supply will be limited, although recent improvements in prime movers, station electrical equipment and other power-plant apparatus will go far in introducing economies in operation to offset increased wages and higher cost of fuel.

Eventually, the dwindling of fuel resources will force the national, widespread development of water powers, mammoth power plants at the mouths of the mines, and continental interlinked networks of transmission and distribution. In the meantime, electrification of railway main lines will proceed, the ultimate solution of this electrification coinciding with the linking up of coast-to-coast transmission systems.

In every phase of industrial development some contact is made with electrical equipment. The necessity for more intensive production during shorter periods of working and the necessity for safeguarding labor to the highest degree in securing the greatest possible return for each work hour per unit of man power, led directly to the most intensive motorization of all equipment and the installation of artificial lighting of the most modern characteristics. Motorization and correct industrial lighting alone, bringing in their train a multitude of equipment from the switchboard to the fuse block, will represent a tremendous development in the electrical industry.

Turning, now, to the domestic side of the picture, the evolution of human habits has created a market for electrical appliances far beyond the dreams of the most sanguine enthusiast. There is hardly an electrical device that is not already at a premium and manufacturers are hard put to meet their orders. The amazing demand for electric utensils and the dependence of the public upon these conveniences to cope with modern domestic pressure will force the more adequate wiring of new buildings and the rewiring and readjustment of equipment in houses where an electrical system is already installed.

While for the moment electrical manufacturers are to a great extent on a back-order basis, the ingenuity of the leaders of the industry will speedily bring production nearer to the apparent demand.

To cope with the interest now manifested by the ultimate consumer in electrical merchandising, channels of distribution tributary to those which we have considered strictly electrical are being developed and we find a great volume of electrical supplies and material being handled by department stores, house-furnishing stores, hardware dealers, drug stores and plumbing establishments. This merchandising challenge is being met by the electrical industry through the development of the electrical contractor-dealer and electrical shops are springing up all over the country by the hundreds.

These considerations appear to be those that will be possessed of the greatest possibilities of realization in the period immediately ahead. Political mutations of the country may check some and promote the growth of others. Even under conjectures of minimum expectation the electrical industry appears destined to grow mightily and leap far forward before another year shall have rolled around.

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## COST INCREASES COMPILED BY UTILITY COMMITTEE.

The increase in cost of many materials used by central-station companies is shown in striking manner in a tabulation that has been published by the Illinois Committee on Public Utility Information. The costs are for the years 1910 and 1919 and are as shown in the accompanying table, which shows that materials to the value of $100 at 1919 prices could have been bought in 1910 for about one-half the price.

| | Costing in 1919 | Costing in 1910 |
|---|---|---|
| Poles and ties | $100 | $41.50 |
| Steel rails, heavy | 100 | 51.00 |
| Steel rails, light | 100 | 41.00 |
| Soft steel bars | 100 | 52.00 |
| Structural beams | 100 | 51.00 |
| Pig iron, Lake Superior charcoal | 100 | 52.00 |
| Pig iron, foundry | 100 | 58.00 |
| Cast iron pipe, 6 in. | 100 | 45.00 |
| Wire nails | 100 | 53.00 |
| Wire rods | 100 | 57.00 |
| Galvanized iron wire | 100 | 49.00 |
| Galvanized sheets | 100 | 56.00 |
| Electrolytic copper | 100 | 52.50 |
| Copper wire | 100 | 55.00 |
| Lead | 100 | 62.00 |
| Tin | 100 | 38.00 |
| Cedar poles, New York | 100 | 43.00 |
| Cedar poles, 6-in. top, Michigan | 100 | 26.00 |
| Ties, white oak, St. Louis | 100 | 54.00 |
| Ties, yellow pine, New York | 100 | 57.00 |

The cost of lumber at the mills, compared on the same basis, shows that quantities and grades, which now cost $100, could have been bought in 1910 for sums as follows: Oak, $61.50; maple, $62.50; ash, $62.50; beech, $54.25; douglas fir, $55; hemlock, $57; yellow pine, $48; spruce, $60.

"The figures give not only some conception of the tremendously increased operating costs, but also reproduction costs," comments the committee.

"All new work and necessary extensions of properties to keep pace with the growth in population of communities must be done on the basis that the purchasing power of every dollar of revenue has been practically cut in half. With a fixed rate of income, as is the case of the utility companies, such costs are a heavy burden, especially as there is little hope of price recession in the near future and improvement of service cannot be permitted to lag."

# Estimated Value of Electrical and Related Manufactures in 1919

In presenting the accompanying estimate every effort has been made to achieve the maximum degree of accuracy. While the figures are offered only as estimated values, there are some actual figures included in the list. This is particularly true in the fields where the production is controlled by comparatively few manufacturers.

It may be of interest to state briefly the manner in which the estimates were compiled. Inquiries were directed to practically every electrical manufacturer asking for the actual value of his products, manufactured during 1919. Each manufacturer was also asked to estimate the value of the business done by all manufacturers in their field, based on their own production. Where complete returns were received the actual value was computed. Where it was not possible to obtain complete returns in any one field, the returns received were checked against the average of the estimates for that field.

This opportunity is taken to thank those manufacturers who so kindly co-operated in this work and also the various electrical trade organizations who gave valuable assistance.

| Article. | 1917 Value. | Estimate for 1919 of All Manufacturers. |
|---|---|---|
| **Air Washers,** cooling ponds, etc. | $ 210,000 | $ 240,000 |
| **Arc lamps** and appurtenances | 700,000 | 480,000 |
| **Auxiliaries,** steam, for electrical installations, such as pumps, condensers, separators, feed-water heaters, injectors, piping, etc. | 7,575,000 | ..... |
| **Brackets,** pole-line hardware, etc. | 6,250,000 | 6,575,000 |
| **Bells,** buzzers, push-buttons, call boxes, annunciators | 1,750,000 | 2,642,000 |
| **Carbons** for lamps, batteries, brushes or other electrical purposes | 10,000,000 | ..... |
| **Circuit-breakers** | 2,350,000 | 6,500,000 |
| **Conduits** (underground) and similar material | 950,000 | 1,200,000 |
| **Electroplating** and other electrolytic apparatus not elsewhere specified | 2,000,000 | 2,750,000 |
| **Electrostatic machines,** induction coils, medical sets | 750,000 | 900,000 |
| **Elevators,** electric (mechanism only) | 4,500,000 | 6,000,000 |
| **Engines,** gas or gasoline or oil, used to drive electrical machinery | 9,000,000 | 8,000,000 |
| **Engines, steam** (reciprocating) used to drive electrical machinery | 4,500,000 | 4,000,000 |
| **Fans,** electrically operated and direct-connected | 4,700,000 | 8,250,000 |
| **Feeder regulators** | ..... | 750,000 |
| **Fire-alarm** apparatus, also burglar alarms, crossing indicators, etc | 1,000,000 | 900,000 |
| **Fixtures** for electric lighting | 18,300,000 | 12,560,000 |
| **Fuses** | 3,500,000 | 5,020,000 |
| **Generators** | 75,475,000 | 46,875,000 |
| **Glassware,** electrical | 6,000,000 | ..... |
| **Heating** and cooking apparatus, electrical | 6,200,000 | 9,030,000 |
| **Incandescent lamps** (carbon or metal filaments) | 52,000,000 | 67,500,000 |
| **Instruments for measurement and meters,** of all kinds; also ground detectors, scientific and laboratory apparatus, photometers, Leyden jars, X-ray outfits, etc. | 8,500,000 | 10,571,000 |
| **Insulating** material, fiber tape, etc. | 7,550,000 | 8,175,000 |
| **Insulators** (glass and porcelain) | 4,000,000 | 10,500,000 |
| **Interior wiring** supplies, as tubing, interior conduit, molding, junction boxes, rosettes, outlet boxes, etc. | 10,575,000 | 10,500,000 |
| **Lightning arresters** | 800,000 | 2,000,000 |
| **Locomotives, electric** | ..... | 4,500,000 |
| **Mercury-vapor** lamps | 1,100,000 | ..... |
| **Motors,** including parts of machines, boosters, balancers, rotary converters, motor-generators, etc., and all motor applications | 95,470,000 | 103,500,000 |
| **Poles and wire towers,** cross-arms, etc. | 5,100,000 | 6,433,000 |
| **Primary batteries** | 6,000,000 | 6,000,000 |
| **Railway supplies,** electric, such as trolleys and other contact devices, strain insulators, cross-overs, rail-bonds, etc. | 7,300,000 | 7,500,000 |
| **Rheostats,** car controllers, motor starters, etc | 7,000,000 | 6,180,000 |
| **Shafting,** pulleys, clutches, etc., used in electrical generating plants | 1,500,000 | 2,000,000 |
| **Signs,** electric | 3,475,000 | 4,002,000 |
| **Sockets,** switches, cutouts | 9,300,000 | 10,008,000 |
| **Steam turbines,** used to drive (electrical machinery) | 19,200,000 | 14,250,000 |
| **Stokers** | ..... | 8,000,000 |
| **Storage** batteries, including used in automobiles | 16,000,000 | 62,500,000 |
| **Switches,** signals and attachments | ..... | 7,700,000 |
| **Telegraph instruments** and apparatus | 1,000,000 | 1,750,000 |
| **Telephones,** telephone switchboards and distinctively telephonic apparatus | 27,000,000 | 23,500,000 |
| **Transformers,** stationary | 26,000,000 | 21,500,000 |
| **Vacuum cleaners** | ..... | 9,500,000 |
| **Waterwheels,** used to drive electrical machinery | 4,100,000 | 4,000,000 |
| **Welding apparatus,** electric | 460,000 | 1,250,000 |
| **Wires, and cables,** insulated | ..... | 90,000,000 |
| **Wire,** weatherproof | 12,000,000 | 20,000,000 |
| **Wire,** all other electrical | 15,000,000 | 25,000,000 |
| **Wireless apparatus** | 3,100,000 | 2,000,000 |

R. H. Ballard, president of the National Electric Light Association, whose article on conditions during 1919 and the prospect for 1920 begins on the next page, has already made a name for himself as chief executive of the N. E. L. A., although the association year is only about half over. Mr. Ballard accepted the office with a firm determination to make the association really stand for something in central-station affairs. He believed that as a national organization it should interest itself in the broad national problems such as hydroelectric development, railway electrification, relationship with public, etc., taking a definite stand and using its influence and resources to improve conditions.

The task of redirecting the energies of an organization that had become almost unwieldy, of injecting renewed life into association affairs, and of actually reorganizing the machinery of the association to accomplish these broader tasks, would have discouraged a man with less energy, ability and foresight. But President Ballard undertook the task and he is making good. It is too early to give all the details, but some idea of the new order of things is given in his statement, which follows.

# Broadening Work of National Electric Light Association

## Great Possibilities of the Central-Station Industry—Some Services the Association Is Rendering and Greater Services in Preparation—Geographic Sections—Plans for the Pasadena Convention

By R. H. BALLARD
*President, National Electric Light Association.*

A great obligation rests on the electrical industry to lead the way with more large electrical developments which may be immediately effective in increasing production and making labor more efficient, removing drudgery from housekeeping and properly conserving our natural resources.

Thousands of acres of land will readily respond to irrigation by electric pumping, thus adding enormously to the production of foodstuffs. The increased productivity and effectiveness of labor in factories driven electrically and well lighted electrically can be made very great. In these and countless other channels the central stations can best serve the country by making available the greatest possible development of electric power.

A large development program must be backed by favorable public opinion which in general is created and maintained by adequate service to the public, and this, as public servants, it is our paramount duty to provide. If fully informed as to the beneficial influence of electrical development on the country as a whole, the public generally will be behind it. To stimulate this favorable public attitude and to assist the electrical utilities in meeting their varied problems throughout the country there is needed a strong national organization.

### How the National Electric Light Association Is Serving the Industry.

The National Electric Light Association is working out plans which have for their objective an organization of day to day helpfulness to all of its members and the electrical industry as a whole, through setting up facilities to give service to member companies on a number of important subjects. As evidenced during the recent coal-strike situation, this service was effective for all members, large and small, but some of the innovations being undertaken will be of particular interest to the smaller companies, all of whom should be active, participating members of the Association. These services are but the forerunners of still greater service that the Association is now preparing to render.

The physical arrangements of the headquarters of the Association on the eighth floor of the Engineering Societies building, 29 West 39th street, New York City, are being entirely changed by the elimination of dead walls and cubbyhole offices. The new offices when completed in a few weeks will be open, broad, light and airy, with suitable arrangements for members' convenience when visiting headquarters, and it is urged that all members of the Association on visits to New York make the offices of the Association their own. Personal contact with the officials in charge under the direction of M. H. Aylesworth, executive assistant to the president, will be mutually helpful.

### Additional Service Being Developed.

There will be tabulated at headquarters a collection of data and interesting information concerning rate problems which will be available to Association members, who are urged to submit questions or troubles along this line to headquarters. Our technical committees are prepared to submit data and answer inquiries on engineering matters and concerning the economy of production. Much helpful information may be obtained from our commercial committees on "down to date" selling methods. Our several accounting committees have gathered much material on accurate accounting methods, and the Electric Vehicle Section is prepared to outline the advantages of this form of transportation as well as its limitations. General information concerning results of municipal ownership may be obtained, and our insurance expert is prepared to assist member companies generally. These are only a few of the services that the Association makes available to its members.

With the first of the year there will be a change in the form of the monthly bulletin, and its attractiveness will be enhanced by making of it a more useful house organ for Association affairs.

A great work is being conducted by the Committee on Education in arranging for educational courses on such subjects as practical electricity, commercial engineering and accounting. Company executives generally are interesting themselves in these educational courses with a view to organizing classes in their own companies directed by one of their own men, thus giving the personal touch to this educational work, and providing a strong incentive to employes for self education.

### Development of Geographic Sections.

In studying the sentiment in different sections of the country while on a tour recently, I found the general interest in Association affairs very much on the increase, and in those parts of the country where Geographic Sections are function

ing this interest has arisen to the point of enthusiasm. The answer to a somewhat lagging interest and apathy displayed in some other parts of the country is the organization of Geographic Sections. The only objection I have heard to the Geographic Section idea is that it might interfere with certain state associations, but this objection is based on a misapprehension of what is proposed for the Geographic Sections.

They are not to actually supersede state associations which have certain activities peculiar to their own states, some of which it would not be in the province of our Association to perform. The Geographic Section may, however, handle in a broader way some of the operating and development questions now being considered by the state associations, and discussions of these subjects from the standpoint of the conditions in several states in a given territory, rather than as peculiar to the smaller area of one single state, should be much more effective and lead away from provincial ideas.

### Plans for the National Convention at Pasadena Next May.

At the next annual convention to be held in Pasadena, Cal., May 18 to 21, the meetings will be practically all general sessions, at which big, broad subjects affecting the industry at large will be considered. Prominent men in our industry from all parts of the country are responding liberally and enthusiastically to requests for service on general committees, and in addition to the reports of committees from the several national sections, some of the larger questions to be considered are water-power development, electrification of steam railroads, electrical resources of the nation (private and municipal), service, co-operation in the industry and public information.

Prominent operators and investment bankers are being invited by Pacific Coast companies to come out to the Pasadena convention and participate in the discussions of these big subjects as well as to become personally acquainted with the electrical and general business development of the Pacific Coast, which has been so substantial during the last few years. Representatives of state public service commissions are also being asked to attend the convention and a general face-to-face personal contact and rubbing of elbows with those really responsible for the electrical development of the country after a year of strenuous preparation and reorganization should doubtless prove to be the most helpful event of the year 1920.

"About one-half of our administrative year has passed and through the wonderful co-operation and helpfulness displayed by Vice-presidents Martin J. Insull, M. R. Bump, Frank W. Smith and Walter H. Johnson, and all officers of the Association, members of the Executive Committee and all general committees and sections, considerable progress has been made. It now remains for us to continue this enthusiastic co-operation and concentrate our best efforts in rounding out the year of helpful service to the industry as a whole, culminating in a rousing working convention of actual accomplishment."

**Tentative Distribution of N. E. L. A. Geographic Sections.**

Apropos of Mr. Ballard's remarks presented above, the accompanying map, developed by R. J. McClelland, chairman of the Committee on Geographic Sections, and approved by Vice-president Bump, is of interest. It shows a tentative subdivision of the Unted States into geographic sections .

At the present time the distribution and division of states into the sections shown is purely tenative. Replies to a large number of telegraphic inquiries sent out by Mr. McClelland to all sections of the country were practically unanimously enthusiastic in agreeing in some such co-ordination of sections.

## COMMITTEES OF THE N. E. L. A. AND THEIR CHAIRMEN.

### Complete List of the Committees of the National Association and of Its Commercial, Vehicle, Accounting and Technical Sections.

Supplementing the remarks of President Ballard of the National Electric Light Association on the activities of this influential organization, it is apropos to publish a complete list of its committees and their chairmen. This gives a striking impression of the strong directing personnel of these very important subdivisions of the association, through whom the great bulk of the organization's work is done. Selection of these chairmen was given personal attention on the part of Mr. Ballard.

### Chairmen of National Committees (General).

Company Sections—F. A. Birch, Philadelphia Electric Co., Philadelphia.
Constitution and By-Laws—W. C. L. Eglin, Philadelphia Electric Co., Philadelphia.
Doherty & Billings Prize—A. S. Loizeaux, Consolidated Gas, Electric Light & Power Co., Baltimore.
Exhibition—C. L. Peirce, Jr., Hubbard & Co., Pittsburgh.
Finance—Joseph McCall, Philadelphia Electric Co., Philadelphia.
Lamp—Frank W. Smith, United Electric Light & Power Co., New York City.
Membership—Walter Neumuller, New York Edison Co., New York City.
Class C Membership Applications—Walter Neumuller, New York Edison Co., New York City.
Public Policy—John A. Britton, Pacific Gas & Electric Co., San Francisco.
Rate Research—Alex. Dow, Detroit Edison Co., Detroit.
Relations with Educational Institutions—J. F. Gilchrist, Commonwealth Edison Co., Chicago.
Accident Prevention—C. B. Scott, Bureau of Safety, Chicago.
Safety Rules—W. C. L. Eglin, Philadelphia Electric Co., Philadelphia.
Bulletin—A. Williams, New York Edison Co., New York City.
Electrification of Steam Railroads—F. M. Kerr, Montana Power Co., Butte.
Water Power—F. T. Griffeth, Portland Railway, Light & Power Co., Portland, Ore.
Co-operation in the Industry—L. H. Newbert, Pacific Gas & Electric Co., San Francisco.
Service—S. M. Kennedy, Southern California Edison Co., Los Angeles.
Electrical Resources of the Nation—M. S. Sloan, Brooklyn Edison Co., Inc., Brooklyn.
Public Information—J. F. Gilchrist, Commonwealth Edison Co., Chicago.

### Chairmen of Commercial Section Committees and Bureaus.

Electrical Salesman's Handbook—I. Lundgaard, Rochester Gas & Electric Corp., Rochester, N. Y.
Education—F. R. Jenkins, Commonwealth Edison Co., Chicago.
Compensation of Salesmen—Adolph Hertz, New York Edison Co., New York City.
Commercial Service and Relations with Customers—R. F. Bonsall, Consolidated Gas, Electric Light & Power Co., Baltimore, Md.
Sale of Company Securities to Customers and Resident Citizens—A. H. Hockenbeamer, Pacific Gas & Electric Co., San Francisco.
Relations with Contractors, Dealers, Jobbers and Manufacturers—M. S. Seelman, Brooklyn Edison Co., Brooklyn.
Finance—M. S. Seelman, Brooklyn Edison Co., Brooklyn.
Wiring—R. S. Hale, Edison Electric Illuminating Co., Boston.
Power Sales Bureau—R. H. Knowlton, United Gas Improvement Co., Philadelphia.
  Division on Isolated Plants—J. B. Stuart, Public Service Corp. of New Jersey, Elizabeth, N. J.
  Electric Development Division—M. Dellplain, Northern Indiana Gas & Electric Co., Hammond, Ind.
  Division on Industrial Electric Heating—N. T. Wilcox, Mississippi River Power Co., Keokuk, Ia.
  Division on General Power—W. E. Murphy, Minneapolis General Electric Co., Minneapolis, Minn.
  Division on the Economic Use of Central Station Electric Power—John W. Meyer, Philadelphia Electric Co., Philadelphia.
  Electric Furnace Division—Joseph McKinley, Duquesne Light Co., Pittsburgh.
  Division on Electrochemical Processes—C. H. McClure, Commonwealth Edison Co., Chicago.
  Division on Power Contract—R. H. Ashworth, Utah Power & Light Co., Salt Lake City.

Advertising and Publicity Service Bureau—L. D. Gibbs, Edison Electric Illuminating Co., Boston.
  Motion Picture Film Division—C. H. Peirson, Southern California Edison Co., Los Angeles.
  Illuminating Engineering—Nontechnical Applications Division—P. B. Zimmerman, National Lamp Works of General Electric Co., Cleveland.
  Co-ordinate Advertising and Sales Campaign Division—H. Harris, Duquesne Light Co., Pittsburgh.
  Adequate Outlets Division—P. L. Thomson, Western Electric Co., New York City.
  National Commodity Advertisers' Division—E. E. Whitehorne, 120 Broadway, New York City.
  Publications Division—C. Nast, New York Edison Co., New York City.
  News Syndicate and Magazine Writers' Division—F. B. Rae, Jr., 4500 Euclid avenue, Cleveland.
  Newspaper Advertising Campaigns Division—M. Turner, Cleveland Electric Illuminating Co., Cleveland.

Merchandise Sales Bureau—E. A. Edkins, Commonwealth Edison Co., Chicago.
  Division on Electrical Merchandise—F. D. Pembleton, Public Service Electric Co., Newark, N. J.
    Subcommittee on Stock—D. R. Smith, Consolidated Gas & Electric Light & Power Co., Baltimore.
    Subcommittee on Buying—M. C. McLaughlin, Potomac Electric Power Co., Washington, D. C.
    Subcommittee on Cost of Selling—H. A. Lewis, *Electrical Merchandising*, New York City.
  Electric Range Division—J. P. Clayton, Central Illinois Public Service Co., Springfield, Ill.
  Division on Present and Prospective Conditions of Central-Station Merchandising—S. A. Dennis, *Electrical Merchandising*, New York City.
  Division on Electric Shop Management—C. E. Greenwood, Edison Electric Illuminating Co., Boston.
  Division on Research and Sales Promotion—W. S. Byrne, Nebraska Power Co., Omaha.
  Division on Standardization and Testing—O. R. Hogue, Commonwealth Edison Co., Chicago.

Lighting Sales Bureau—C. L. Law, New York Edison Co., New York City.
  Division on Lighting of Large Buildings—G. B. Regar, Philadelphia Electric Co., Philadelphia.
    Large Building Group—C. M. Masson, Southern California Edison Co., Los Angeles.
    School Group—W. T. Blackwell, Westinghouse Lamp Co., Bloomfield, N. J.
    Railroad Station Group—R. E. Markley, Philadelphia Electric Co., Philadelphia.
    Church Group—R. B. Ely, Westinghouse Lamp Co., Bloomfield, N. J.
  Division on Residence Lighting—C. M. Masson, Southern California Edison Co., Los Angeles.
    Large Residence Group—F. H. Murphy, Portland Railway, Light and Power Co., Portland, Ore.
    Apartment House Group—M. Luckiesh, National Lamp Works, Cleveland.
    Small House Group—G. B. Regar, Philadelphia Electric Co., Philadelphia.
  Division on Commercial Aspects of Lamp Equipment—G. H. Stickney, Edison Lamp Works, Harrison, N. J.
  Division on Street and Highway Lighting—W. T.

Dempsey, New York Edison Co., New York City.
Division on Store Lighting—F. C. Taylor, Rochester Gas & Electric Corp., Rochester, N. Y.
Division on Industrial Lighting—H. H. Magdsick, National Lamp Works, Cleveland.

**Chairmen of Electric Vehicle Section Committees.**

Insurance—Secor Cunningham, Jr., Commonwealth Edison Co., Chicago.
Transportation Engineering—F. M. Feiker, *Electrical World*, New York City.
Motion Picture Film—Dr. Carl H. Reed, Electric Storage Battery Co., Philadelphia.
Garage and Rates—Willis M. Thayer, Hartford Electric Light Co., Hartford, Conn.
Federal and Municipal Transportation—James H. McGraw, McGraw-Hill Publishing Co., New York City.
Legislation—G. A. Freeman, Walker Vehicle Co., Chicago.
Standardization—E. R. Whitney, Commercial Truck Co. of America, Philadelphia.

**Chairmen of Accounting Section Committees.**

Purchasing and Storeroom Accounting—W. F. Stevens, Edison Electric Illuminating Co., Boston.
Bonus Systems—H. A. Snow, Detroit Edison Co., Detroit.
Accounting Education—Douglass Burnett, Consolidated Gas, Electric Light & Power Co., Baltimore.
Federal Income Tax Procedure—H. E. Addenbrooke, Commonwealth Edison Co., Chicago.
Customers' Records and Billing Methods—J. D. Jacobus, Detroit Edison Co., Detroit.
Classification of Accounts and Accounting Relations with Other Associations—W. Schmidt, Jr., Consolidated Gas, Electric Light & Power Co., Baltimore.
Motor Vehicle Records—G. P. Landwehr, Philadelphia Electric Co., Philadelphia.
Form of Annual Report to Commissions—W. J. Meyers, United Electric Light & Power Co., New York City.
Credits and Collections—David Darlington, New York Edison Co., New York City.
Merchandising Accounting—C. W. Johnson, Public Service Electric Co., Jersey City, N. J.
Accounting Service to Member Companies and the *Monthly Bulletin*—Frederick Smith, New York Edison Co., New York City.
Insurance—E. J. Fowler, Commonwealth Edison Co., Chicago.

**Chairmen of Technical and Hydroelectric Section Committees.**

Inductive Interference—A. E. Silver, Electric Bond & Share Co., New York City.
Meters—F. V. Magalhaes, New York Edison Co., New York City.
Overhead Systems—W. K. Vanderpoel, Public Service Electric Co., Newark, N. J.
Prime Movers—N. A. Carle, Public Service Electric Co., Newark, N. J.
Underground Systems—F. E. Ricketts, Consolidated Gas, Electric Light & Power Co., Baltimore.
Electrical Apparatus—R. F. Schuchardt, Commonwealth Edison Co., Chicago.

## SCHEDULES FOR MERCHANDISING AND LIGHTING SALES.

### Division of Co-ordinate Advertising and Sales Campaigns, N. E. L. A., Issues Schedules and Reminders to Central Stations.

The Commercial Section of the National Electric Light Association, under the direction of its Division on Co-ordinate Advertising and Sales Campaigns, is about to put into effect its plan as submitted to the 1919 N. E. L. A. convention at Atlantic City.

This plan provides for the issuance of monthly reminders by the section, calling attention to the merchandising schedule under which it is expected that special drives will be made on certain devices each month in the year. These reminders will be sent to the central stations six or eight weeks in advance of each monthly special sale or drive, and it is proposed to list on these monthly reminders the manufacturing companies which are prepared to supply advertising matter on the appliances or devices appearing on this schedule.

The purpose of having these reminders reach the members six or eight weeks in advance is that they will be enabled to obtain such advertising matter as may be available from manufacturers and to enable them further to supplement such free matter with any other forms of advertising which they may desire. At the same time, special articles will appear in the N. E. L. A. bulletins, and all manufacturers are asked to co-ordinate their advertising with the schedules as far as possible when making up their advance plans for publicity. The merchandising and lighting schedules are given in the following:

MERCHANDISING SCHEDULE.

January—Clearance sale.
February—Heating pads.
March—Vacuum cleaners.
April—Sewing machines and sewing-machine motors.
May—Grills.
June—Irons.
July—Fans.
August—Clearance sale.
September—Washing machines.
October—Radiant heaters.
November—Toasters.
December—Electrical Christmas gifts.

LIGHTING SCHEDULES.

January—Better lighting.
February—Outdoor lighting (tennis courts, playgrounds, etc.).
March—Stores and windows.
April—Residences.
May—Electrical advertising (signs, outline lighting, display lighting, etc.).
June—Public buildings.
July—Industrial.
August—Stores and windows.
September—Electrical advertising (signs, outline lighting, display lighting, etc.).
October—Residences.
November—Better lighting (with emphasis on office buildings).
December—Industrial.

## AIRPLANE ENGINES NOW FURNISH STATIONARY POWER.

Interesting and important experiments are being carried on in England in connection with the utilization of the airplane engine for ordinary commercial purposes. By making an alteration in the carburetor it is possible to run the engines on coal gas, and they have been connected to dynamos with very good results. While second-hand airplane engines have a limited market, it is believed that as stationary power units they will prove a useful innovation in plants of moderate size.

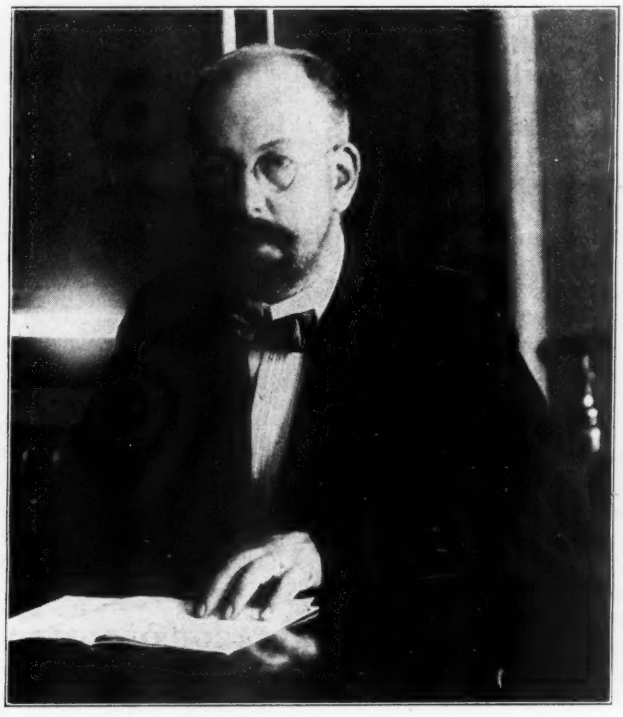
# Plans of the Illuminating Engineering Society for 1920

## Public Recognizing Value of Light, but Needs Guidance to Prevent Its Abuse—Society Will Broaden Its Educational Work So All Dealing with Lighting May Do so Intelligently

By S. E. DOANE
*President, Illuminating Engineering Society.*

I have been asked to discuss the plans and activities of the Illuminating Engineering Society. I shall try to do this conservatively, but let me say at the outset that I see so many opportunities ahead, so great a chance for progress, that I am afraid I shall appear overenthusiastic to my readers.

To my mind, the year we have just seen come to a close marks a turning point in artificial lighting. We have seen the old lighting standards, which illuminating engineers have for years been struggling to raise, suddenly thrust aside by the users of light and new ones substituted. We have seen light taken out of the janitor service class and put on an equal plane with the automatic machine and other labor-saving devices. In the period of a few months, light has ceased to be considered merely an unavoidable expenditure; it has become part of the productive equipment of the plant.



Samuel E. Doane.

### Favorable Change in Public's Attitude as to Lighting.

We have seen and heard many evidences of the public's new interest in lighting within the last few months. I have no desire to dwell on that which is obvious, but I wish to mention an illustration which came to my attention a few days ago. The general manager of a manufacturing plant decided to try out a high-intensity lighting system in his armature-winding department. He was so impressed with the system, which supplied between 10 and 12 ft.-candles of properly diffused light, that he at once ordered an installation to supply nearly double that intensity. His contractor argued with him, explaining that his present intensity was surely high enough, but the manager insisted on the higher intensity. The contractor agreed to put in a trial installation supplying 18 ft.-candles. As soon as this trial installation was made, the manager at once ordered this intensity for the entire department. From data at present available, we cannot say whether this man erred on the side of spending too much money for light or not, but the incident serves as an illustration of the change in attitude. When the user looks at light in this way, we must believe that he considers it a sound investment.

Like other equipment, light may be used or misused. The present interest in light must be directed in such a way that good, not harm, will result. The Illuminating Engineering Society has, I feel, a serious responsibility to the public in this regard, and we must assume that responsibility without hesitation.

I cannot help but feel that there is an opportunity for wonderful progress open to us this year. When our game of golf or tennis runs into the evening, we presently note that our eyes follow the rapidly moving ball only with conscious effort, although they see it readily enough when stationary; later, we cannot follow it at all and our game is entirely halted. Those of us who have had occasion to make adjustments under the hoods of our automobiles at night in our own garages know that it is impossible to work satisfactorily where sharp, black shadows are present. Yet many factories have been supplying lighting just about as inadequate for their workmen. We do not have to be members of the Illuminating Engineering Society to know that poor illuminating handicaps work and decreases production. There is much promise for lighting progress in the fact that the public is realizing that in improved lighting there lies the possibility for speeding up manufacturing operations, improving quality, and decreasing accidents. It

is important, too, from a national standpoint, for recent surveys indicate, on the word of industrial executives, that 25% of the manufactured product of this country is turned out under artificial light.

### Society Has Worked and Will Continue to Work for Good Illumination.

A perusal of the records will show that the Illuminating Engineering Society has consistently advanced the cause of good illumination. As a scientific organization, the society has been forced to go slowly, conservatively, making sure of the facts at all stages. In spite of this necessary conservatism, it has done more than any other one organization to promote the cause of good lighting. It has continually called attention to the dangers which lurk in dense, heavy shadows and dimly lighted areas; it has shown that no workman can do his best when he is handicapped by lack of light, and it has fought glare at every opportunity. It has raised its standards of illumination just as rapidly as accumulated evidence warranted.

Now that the public has, so to speak, taken the matter of lighting into its own hands and stimulated by reports of greatly increased production through the agency of high intensities is putting in lighting which illuminating engineers did not dream of a few years ago, it becomes more than ever necessary that the society do everything in its power to see that these high intensities are properly safeguarded as regards glare.

### Need for Safeguarding Against Glare.

How far the man that pays the bills can go profitably in high-intensity lighting, the Illuminating Engineering Society is not prepared to say, but upon this one point, namely, that the highest intensities will not be satisfactory where glare is present, there is entire agreement of opinion. Conversely, no harm can result from the very highest intensities where proper steps are taken to safeguard the installation against glare.

As we go to higher intensities, we use sources of greater and greater brilliancy and power, and more careful provision must be made against glare if these new intensities are to be a benefit and not a detriment to eyesight. The obligation falling upon the society, is, therefore, one of educating those who install lighting systems to the facts in order that the maximum benefit rather than actual harm from the new interest in lighting may result.

### Educational Work Must Predominate.

The program of the Illuminating Engineering Society for the year is one of education. Working through committees, we hope to interest schools and colleges throughout the country in improved lighting to the extent that they will provide really good courses in illumination for their students. We hope that many of them will do as one state university has done—provide an extension course at a nominal fee, so that electrical contractors, dealers, electricians, shop superintendents, in fact, all interested in any phase of lighting can write to their own state colleges for a practical course in illumination. In this way, we hope that there will come into existence a class of "journeymen" electricians whose horizon is not limited by wire, sockets, lamps and reflectors, but who are able to install light intelligently. I make a vast distinction between lamps and light. Lamps are merely a means to an end.

Another field for our committee work lies in the many associations of manufacturers. Through the officials of these associations, we hope to create an interest in lighting which will permeate the whole of the industry that each of these associations represents. And it will be the duty of the committeemen to see that those with whom they come in contact understand that glare is something real and not a technicality—that it is a brake on lighting progress.

### All Other Society Activities Maintained.

I do not mean to convey the impression that other activities in which the society has been interested are to be dropped or sidetracked in any way. As always, we welcome the opportunity to co-operate in all movements tending toward a broader and more intelligent use of light. This society has co-operated in the formulation of every state lighting code which has been adopted, and with many more states interested in this work we hope to be able to serve more helpfully this year. Exploration of the scientific and technical field will go forward as usual, stimulated we hope by the return of the world to a more nearly normal basis. But the foremost activity will, as I have said, be one of education, of acquainting the users of illumination with lighting facts, of making light something real and tangible, something that can be measured, controlled, and applied intelligently to accomplish definite purposes.

I feel that the new interest in light will result in tremendous progress if this interest is properly directed. I know that the society can measure up to the task ahead of it.

## LABOR OPPOSES PUBLIC OWNERSHIP OF UTILITIES.

People have come to look upon workmen's unions and the socialists as much the same in hopes and demands. However, while it is true they often both expect and demand the same things, the unions and the socialists often differ also. In a recent editorial appearing in the Indianapolis *Union*, the oldest labor paper in the United States, the following is said regarding public ownership:

"We know—every man of us knows—that there isn't a city hall or court house or other government center in the country that is not managed in such fashion as would bring an institution not backed by the public purse to bankruptcy in short order.

"What guarantee have we that a government controlled railroad system, backed by a political machine operated by two million or more votes, would be free from the evils that are common to all government controlled organizations—except the army and navy, which has no vote? Why, the country would be practically at the mercy of such a machine. And labor, as a whole, would pay the freight on a politically framed tariff that might overwhelm us."

# Development of the Electrical Contractor-Dealer Field

## Big Impetus to Retail Merchandising by the Local Electrical Dealer Given Through Influence of the National Association of Electrical Contractors and Dealers

By W. H. MORTON

*General Manager and Secretary, National Association of Electrical Contractors and Dealers.*

No better evidence of the rapid growth and development of the electrical industry can be presented than that which our Association has recently caused to be compiled on the growth of retail distribution.

The data referred to were collected from 241 cities throughout the country, in which are now located almost 1500 electrical retail stores and about twice that number of other stores handling electrical goods at retail.

The figures show that, while the greater part of the period covered was during the war, yet there were more than 400 new electrical stores organized and almost an equal number of established electrical stores that made marked changes towards the improvement of their places of business.

W. H. Morton.

The period covered was about two years and the number of new and improved stores totaled almost nine hundred.

Think what this means to the electrical industry as a whole! It is hardly possible that any other line of industry can show in any one branch such an increase of new and improved stores, especially during such a period of depression in all retail lines.

### The Association's Research Bureau.

Great impetus was given the merchandising movement by the conference held in Milwaukee just preceding the annual convention in July. Representatives of manufacturers, jobbers, central stations and the press met with contractor-dealers to discuss the plans for the Research Bureau proposed by our Association. Everyone present endorsed the movement and pledged their co-operation and support and as a result the manufacturers guaranteed a fund to carry out the work on a national basis. The local work will be financed by central stations, jobbers and contractor-dealers in the respective communities in which campaigns are undertaken.

Another significant development during the year was the increased interest in the future of the contractor-dealer on the part of the jobber, as exemplified by the discussion at the jobbers' convention in November. At one session, which developed into an experience meeting, numerous jobbers told of the substantial increases in business which have come about as a result of co-operating with contractor-dealers and at least one jobber made the statement that since inaugurating a new policy of helpfulness toward the contractor his business from this source had reached the imposing figure of 75% of the total and this without any loss of industrial business which, in the past, had averaged 75%. Practically all of the jobbers present at the convention expressed faith in the continued development of the contractor as a retail dealer and the improvement of the present retailer. They recognize that the urgent need today is for more retail outlets for electrical merchandise and furthermore that the electrical contractor is the logical man to enter the retail business.

Our Association has continually advocated what are called promotional campaigns to the end of more rapidly introducing electrical appliances and devices to users, and in the various states and sections wherein active campaigns of promotional nature have been instituted and are being successfully carried along, there are shown a larger number of distinctively electrical stores with a lesser number of other stores that sell electrical goods.

It is also pleasing to note that in the sections where these promotional activities are progressing there have been a larger number of new stores opened with also a greater number of improvements made in old stores.

Co-operation is the keynote of this activity, and it is to be hoped that all the various branches of the industry will work together in the closest harmony during the coming years while we all are still in the development stages of the electrical retail trade.

### The Next Annual Convention in Baltimore.

The National Association of Electrical Contractors and Dealers will hold its twentieth annual convention in the city of Baltimore, beginning on the sixth day of October next. It is hoped to make this 1920 gathering the largest of

the kind in the history of our organization, and enthusiastic members are all working to this end.

The slogan which we have adopted in furthering the promotion of this event is: "Two Thousand Members with a Thousand at Baltimore in 1920."

Baltimore is an ideal convention city, and particularly at that time of the year will its beauties appeal to visitors. Those who are looking forward to their annual vacation should keep this date in mind—October 6, 1920—with a view to joining our organization in its endeavor to make its annual convention one of the big electrical events of the year.

While retailing in the electrical industry is still in the development stage, it has been growing rapidly. During the past year it has probably advanced to a greater extent than any of the other industries of our great country. Still there is no doubt in the mind of the writer, but that it will show greater improvement and development during the year of 1920.

No statement regarding the outstanding features of the year 1919 would be complete without reference to the increasing acceptance of the principles laid down by W. L. Goodwin. While electrical contractor-dealers, through the Association, have accomplished a great deal towards enlisting the co-operation of allied branches of the industry, they have not lost sight of the work to be done among themselves. In the matter of accounting, estimating, merchandising, etc., great progress is being made and the contractor-dealer of today is vastly better equipped to assume his full responsibilities than ever before.

## DEALER AND DEPARTMENT-STORE COMPETITION.

**Samuel Adams Chase Shows Why the Electrical Dealer Has Nothing to Fear From Department-Store Competitors.**

Speaking before a meeting of the Missouri State Association of the National Association of Electrical Contractors and Dealers, held at St. Louis last fall, Samuel Adams Chase made the following remarks regarding competition between electrical dealers and department stores handling electrical goods.

"Fifty years ago, when department stores, the great city kind, came into existence, there was a howl from all the jobbers and retailers. The jobbers lost commissions because the department stores bought in such large quantities that the manufacturers could not afford to ignore them. Retailers of the smaller kind were hit badly for the reason that their overhead was larger than that of the department store. 'Evidently,' argued the jobber and the retailer, 'if we don't kill the department store it will kill us.' But they were wrong. There was plenty of room for all three. There was an economic reason for each of them; hence they lived and thrived—those who didn't fight.

"Why didn't the department store drive the retailer out of business? For a very simple reason. It could sell to the crowd but not to the individual; it has not been able and never will be able to secure personal contact between the purchaser and the seller of the goods—the owner of the store—which is the very essence of successful retailing. All of the great department stores in one city that I am familiar with have electrical goods, yet in some cities in the dry goods district there are many retailers of household electrical apparatus, lamps and appliances, all or most of whom seem to be prosperous. At least, they stay where they are and keep on doing business.

"This class of stores is increasing and you know the reason why. They find out what a customer wants and get it for him or break an arm in the attempt. If he wants a bell put in they will do it for a trifling sum. The contractor-dealer is an economic necessity. They do something the manufacturer and the jobber cannot do. They have the personal touch. They sell a washing machine to the home and see to it that it is properly installed and gives satisfaction and creates a permanent customer of the buyer.

"Does the hardware merchant pay any more attention to your remark 'I can buy nails a cent a pound cheaper across the street' than to politely tell you to 'go buy them'? Then why should the electrical dealer be disturbed if the customer makes a similar remark about the price of sockets?"

## TO DEMONSTRATE WIRING DEVICES AND IDEAS.

**Contractors and Electricians to Be Given Opportunity to Show New Tools, Etc., at Boston.**

Contractors and wiremen of an inventive mind who have developed devices that are a help in electrical construction and repair work have been extended an invitation to exploit such devices at a meeting of the Boston District of the Massachusetts State Association of Electrical Contractors and Dealers to be held in Boston Jan. 15. The purpose is to bring about an exchange of ideas that have not been put into general use owing to the inability of individuals to properly bring them before those who naturally would be interested. Space and current will be supplied for practical demonstrations, so that electricians may illustrate and lecture on any new devices or ideas they have.

## DESCRIPTIVE FOLDERS INCREASE DEALER'S SALES.

The influence on the public created by national advertising done by electrical manufacturers is reflected in the demand by dealers, jobbers, central stations and others for imprinted folders describing the devices advertised. The national advertising paves the way for the dealer's direct mailing and use of the imprinted folder. It introduces the article to the prospective customer, who, having his interest aroused, will read the folder and thus make it easy for the dealer to close the sale. The effect of these forms of advertising is increased if the dealer is posted on the merits of the article through the advertising pages of his trade papers. These three forms of advertising become accumulative in their effect and create sales for the dealer, jobber and manufacturer.

# Central-Station Operation and District Heating Service

## Field of District Heating—Co-ordinating Supply of Kilowatt-Hours and Heat Units—Opportunities for Increasing the Revenue and Conserving Fuel

By I. L. KENTISH-RANKIN

One of the outstanding features of the last two and more years has been the coal situation. Coal has been scarce. Coal is expensive, and from all indications, there appears little hope that coal will ever be cheap again. With this condition obtaining, attention has naturally been forced upon coal in the endeavor to obtain more results for a smaller expenditure upon it.

Coal is such a large factor in central-station production that its cost and methods of using it are of vital importance to the central-station company. That this is appreciated, and that effort has, and is still being made to utilize coal more efficiently is shown by the various ways and means adopted and proposed.

One hears less now as to whether money spent in boiler-room instruments is a good investment. It is a question of how many can be used efficiently rather than how few can be got along with.

Attention has not only been given to producing heat more efficiently, but serious effort is being made to waste less of it when produced. Pipe coverings are now recognized as an investment that pays for itself in short time, even in small plants. Closer attention to operation is doing much to reduce the coal used for banked fires and save coal by operating individual units at their highest efficiency. Attention to vacuum as a fuel-saving measure is now practiced in plants that not long ago attended to vacuum only when it was difficult to maintain it due hot condensing water, etc. Maintenance of clean condensers and the prevention of leaks are fuel-saving measures.

The statement has often been made, and with slight qualification that statement is absolutely true, that it is in the boiler room that the greatest saving of coal can be made. This statement presupposes that present methods of producing kilowatt-hours remain. But at a time when conditions are changing, and have already changed so radically that the price of coal has doubled in a comparatively short time, must the present ways of producing kilowatt-hours continue unchanged? If other conditions have changed why should not the present method of central-station production change too? There are many reasons why, urgent, profitable and moral reasons why the typical central-station method of converting chemical energy of coal into electrical energy should be modified in every instance where it is feasible to do so.

It is to obtain more heat from a given fuel that so much attention has been directed to the boiler room, to the use of instruments, stokers, higher boiler settings, etc. It is to bring about higher efficiencies that economizers, larger boilers and turbines are being used. It is to attain greater utilization of the heat energy that higher steam pressures and temperatures are advocated. These are all worth while measures, and all aim to conserve fuel by producing heat more efficiently and converting it to another form of energy more efficiently. But there is another large loss of heat in the process of conversion from chemical to electrical energy, and this loss is the largest single loss in the cycle of changing from thermal to electrical energy. That loss is the loss from condensation in the condenser. It is the loss of heated circulating water that flows to waste unused. It is a loss of somewhere between about 57 to 62% of the total heat available for use by a turbine operating condensing.

The large central station is very efficient because it is able to use large efficient machines, operate them advantageously at efficient outputs and under favorable load-factors with able personnel. The very large central station of most modern design is looked upon the acme of perfection—as it is perhaps on the basis of kilowatt-hour production. But in producing kilowatt-hours, and nothing else, it allows to go to waste some 60% of the total heat available, whereas that same heat could be used in any way where heat is required.

Large central stations of the best modern design employing, of course, steam turbines, are generating a kilowatt-hour with a heat consumption of about 17,000 B. t. u. when operating at 300 lbs. steam pressure and a 60% load-factor. By increasing the steam pressure and superheat as has been proposed and so widely discussed during the last three years an increase in efficiency is expected to enable a kilowatt-hour to be produced on about 15,000 B. t. u. Meanwhile over 50% of the heat produced remains unutilized, to pass away down the sewer.

The question that is forced upon anyone is, "While continuing the attempt to increase the efficiency in heat production and energy conversion, cannot something be done to turn to use the heat incident to operating condensing? What is the true fuel economy, if one vast station is producing one kilowatt-hour upon 17,000 B. t. u. and while so doing is passing to the sewer, to the river or in other ways wasting, several times this number of thermal units while factories, office buildings, restaurants and others in close proximity are making heat less efficiently but are using it more economically in that the 60% the central station cannot use is being

used?" The question can be answered only by differentiating between heat and electrical energy.

The central station produces kilowatt-hours, and on the basis of pounds of coal per kilowatt-hour can produce more kilowatt-hours than can the isolated plant. But the isolated plant may need also in addition to kilowatt-hours heat, hot water or steam. When this condition obtains—and it is the condition that obtains most generally—the kilowatt-hour can be produced as a by-product to the hot water or steam. There are objections to the isolated plant's operation, but they concern financial economy and not thermal or thermodynamic economy.

The greatest opportunity for fuel saving that exists today is to co-ordinate the manufacture of kilowatt-hours with the supply of heating service. The two processes go together, and they belong to each other. The central stations have been so engrossed upon producing kilowatt-hours that they have overlooked the fact that they are producing heat for which a demand exists in small part the entire year, and in its entirety for several months in the year.

In comparing the isolated plant with their own operating performance, the central-station manager has spoken in terms of the kilowatt-hour, and not on the basis of thermal units used. In any community there is just as much demand for heat as there is for light and power; the former is vital, the latter only desirable. May it not be that eventually the supply of heat and the supply of electricity will go hand in hand?

## District Heating.

District heating, the supply of hot water or steam, has come into rather bad repute since attention was first directed upon it because many companies went into the undertaking blindly. They based their actions upon optimism instead of upon sound reasoning. They did not study their problems; they failed to employ correct methods of distribution and heat conservation; they did not realize the necessity for determining the cost of service, whether or not it would pay to connect up service, and their method of charging for service was not always economically nor scientifically sound. They went about the problem unscientifically, haphazard and without knowing either the cost of service or the prospective revenue. And they failed.

Conditions are very different today. Heating men, but central-station men particularly, are still talking about 50-cent steam, whereas steam can afford to be sold at 90 cents per 1000 lbs. Central-station men are still thinking of conditions as they existed in 1900 instead of realizing that we are now in 1920, that the war is over and the price of coal is almost comparable with the price of sugar.

The greater the congestion the more favorable are conditions for district steam heating. Under such conditions the load is dense, hence the pipe lines relatively short as compared to amount of steam consumed, the revenue high and the investment low per unit of steam sold. Under congested living conditions the smoke nuisance tends to become more acute, hence the more costly in lives and treasure. The steam-heating plant is a radical step toward smoke abatement as well as toward fuel economy.

With the great attention now being given toward power-factor correction, fuel economy and smoke abatement, considerable incentive is offered the installation of the district heating plant. Such a plant, while producing its power under the most efficient conditions as regards plant design, is able to produce electrical power which may be sold or used to assist the electrical system at very low cost. The price obtained from heating may suffice to pay all fixed charges and operating expenses, leaving a margin, sometimes small and sometimes large, which may be added to that accruing from the sale of electric energy.

## Turning the Small Plant to Advantage.

In general terms, the district steam-heating plant has come to be looked upon as a large station used exclusively for supplying hot water and steam to a large network of buildings and industries. This is but one phase of the matter, however. There is another phase, and an important one.

The large steam generating station makes for economical use of coal, hence production of steam. But often interconnection of a number of comparatively small plants may prove the more economical. Moreover, it is often possible to connect up a number of small plants already in use whereas the construction of a larger plant to replace them *in toto* might not only be unprofitable if done, but impossible to accomplish.

The small isolated plant has come in for much condemnation by the central-station fraternity. And it deserves much of it. But while its size is very largely responsible for the low economy obtained there are other factors involved. One of these is the lack of talent employed—a factor that can be remedied and is gradually being remedied. The other factor is the load-factor. The load-factor of the small isolated plant is usually low. It is the much higher load-factor of the central station that is largely responsible for the higher economy obtained, to which contribute the facts that larger units of higher efficiency, higher quality of personnel, etc., are possible with the large station.

Central stations have during the last few years gone after what has been termed summer service. This class of service permits the small isolated plant to shut down during the warm months when heating is not required and save the cost of producing power themselves by purchasing electricity from the utility. Such a step often leads ultimately to the complete shutdown of the isolated plant. It would seem that a serious effort toward taking over some of these isolated plants by the utilities, and operating them as circumstances dictate, would be sound business upon the part of more utilities. In some instances this is being done, and to good advantage.

It is surprising what results in the way of improved economy can be brought about in the isolated plant, when real effort is made to do so. Under central-station operation many an isolated plant can be made to operate more economically; the fuel cost, per ton, will usually be lowered, because of the more favorable purchasing power of the utility and the revenue from operation

increased. There is a further gain in economy because of the higher load-factor that is feasible when an isolated plant ceases to be isolated because it interconnects with an electrical distributing system.

To shut down many isolated plants and replace their service by central-station service would be an engineering farce and an economic crime. The sound solution is not to shut these stations down, but allow fewer of them to do the work. By interconnecting these plants, many of them could be dispensed with altogether. And the operating economy of those that remain would be improved by higher load-factor, better supervision and often improved equipment.

It is pertinent to remark that much of the investment of the central station is sunk in transmission lines and circuits. This distributing network imposes energy losses which can be quite readily capitalized in money or fuel. On a basis of kilowatt-hours, close investigation might show that the actual over-all fuel saving of a large plant is considerably less than thought when charging the line losses against the large station when these losses are eliminated where smaller stations are more advantageously situated with regard to load. This is a factor favorable to linking up the so-called isolated plants.

Another fact worth bringing before the notice of the central stations is that a number of real estate boards, property owners and similar bodies and associations have realized the saving incident to connecting up various small plants and thus pooling the load, co-ordinating service and eliminating wastes. Where such bodies find profit, surely a central station would find profit too, and greater profit.

### Stand-By Stations and Heating Service.

The stand-by station in connection with heating service is one phase of public service and utility revenue that the central stations have passed by without the attention it deserves. The supply of hot water and steam from stand-by stations is a form of business that should prove lucrative to the utilities able to undertake it.

The stand-by station was originally built and maintained in service so that service could be delivered should the transmission line be interrupted or should lack of water prevent supply of normal energy. It so happens in many cases that the stand-by station remains idle, but ever ready during the winter months when there is ample water at the generating station. During the summer, however, the stand-by station may be called into service to make up the shortage at the hydraulic plants. Under these conditions—comparative idleness during the winter—a stand-by station can remain ready, and yet supply heat in the way of hot water and steam for heating and for hot water. By doing so the station is really more prepared to pick up load, return is being earned on the money invested in plant, and the labor charge is being met out of revenue from heating or operation instead of out of revenue from sale of current.

The stand-by station operating as well as standing by "in readiness to serve" may by proper design be made to correct for power-factor, and improve voltage regulation and thus actually help out the transmission line by reducing the wattless current in circulation. Cessation of power supply from the distant water power may be instantly picked up, a condition that does not obtain where a stand-by station has steam up but not the turbines running.

That the stand-by steam generating station offers a very advantageous opportunity for the wide-awake central-station company to turn loss to profit—and a very nice profit—has been amply demonstrated in a number of instances. As the so-called super-power stations at the coal mines become a fact instead of a dream, steam stand-by stations close to the market for the energy of the mines will be necessary, just as they are with hydroelectric systems. The problem of taking on heating service is thus one that may eventually concern very closely many utilities whose managers today shrug their shoulders and say that they operate steam plants, not hydraulic plants, and that they do not need stand-by stations.

### Summary.

Service has been sold to the public, they expect it and are willing to pay for it. Just as electricity supply offers many conveniences, so also does the supply of heating service—hot water and steam to industries, factories, offices, restaurants, hotels, clubs, etc.

The production of electrical energy by central stations is more efficient than when carried on by small isolated and independent plants. The matter assumes an entirely different aspect, however, when it is realized that over half of the heat produced now passes to waste in producing the kilowatt-hour most efficiently.

On the basis of heat production, the isolated plant existing for the express purpose of producing heat and producing kilowatt-hours as a by-product is more economical than the central-station plant. The heat passing to waste in the central stations could replace many isolated plants, and supply towns and settlements with heat.

Electricity and heating service should go together. Heating service can be furnished as live steam, as exhaust steam and as hot water after circulating in the condenser. By means of the compound turbine now available, and by bleeding steam between the high and low-pressure elements or taking it from the exhaust, considerable flexibility exists for operating and economy according to seasons.

The existence of enormous power plants producing kilowatt-hours at low "water-rate" and wasting over 50% of the heat in the process in proximity to many other plants existing solely for the purpose of producing heat units is not compatible with present-day methods of efficiency and conservation.

The central stations have an urgent responsibility to think more in terms of heat units utilized and less of heat units per kilowatt-hour.

The demand is for heat units and kilowatt-hours. Until the utilities furnish both—the only way to attain true economy—they will only be fulfilling part of their obligation to the public and only meeting in part the heavy responsibility that is theirs.

# A History of the Renewable-Fuse Industry

## Recent Approval of Renewable Fuses Closes Interesting Chapter in Annals of the Electrical Industry

By F. T. BANGS

Issuance last week by the Underwriters' Laboratories of approval cards on renewable fuses of several makes marks the culmination of a long and drastic controversy and the close of an interesting chapter in the annals of the electrical industry. This action makes fitting at this time a review of the development of electrical fuses and of the events which led up to the formal approval of renewable fuses by the Underwriters' Laboratories. The essential facts are given in the following article in an unbiased and impartial attempt to bring out the interesting points and the significance of approval to the electrical industry.

Fuses are important because practically all electrical circuits must be fused to reduce fire and accident hazards and protect property and equipment. Whether a fuse should be used once and then discarded after being "blown" or whether a fuse should be made so it can be renewed by the user on the premises by inserting a new fuse element of proper rating is a question that has been of much concern. In the early days of renewable fuses there was much prejudice against them, but it gradually diminished as favorable reports were received regarding their performance in the field, their ability to withstand severe laboratory tests and the economies in maintenance and operation effected by their use. This favorable opinion strengthened the popular demand for renewable fuses and proved to be one of the determining factors that finally resulted in their approval. —EDITOR'S NOTE.

The first attempts at fusing an electrical circuit consisted of inserting a piece of small gauge copper wire in the circuit. The latter would become fused and break when excessive current existed in the circuit.

This practice was succeeded by the use of so-called fuse wire, consisting of an alloy of lead with a small percentage o tin, having a low melting point. To facilitate connections terminal blocks, generally with an insulating base, were used with these open-link fuses.

The distance between terminals determined the length of fuse wire to be used, and this, taken together with the cross-sectional area and physical characteristics of the wire, determined in a rough way the rating of the fuse; that is, the amount of current that could be carried in the circuit before the fuse wire would melt and break the circuit.

The next development of the open-link fuse was to fit the fusible element with copper terminals. By calibrating the element for proper length and cross-sectional area a more accurate rating was secured. Also, the copper terminals assured better connections to the terminal block than the plain fuse wire because the latter was made of soft material.

Link fuses are still used to some extent on switchboards. The rules of the National Electrical Code state that they may be used for other purposes, but only when mounted on approved bases which must be mounted in approved cutout boxes or cabinets. The only advantage that the open-link fuse has is its low cost, but this does not compensate for the recognized fire and accident hazards incident to their use.

### FAULTS OF OPEN-LINK FUSES.

The trouble with open-link fuses is that when they "blow" they actually do "blow," throwing out molten lead and flame and causing a direct fire hazard and possible injury to a person standing nearby. Another disadvantage is that when fuse wire becomes scarce or when operators become tired of putting in new fuse wire, a nail or a piece of heavy wire is used in place of the fuse wire. This defeats the object of the fuse and subjects equipment and circuits to damage and fire hazard.

The blowing of molten metal was confined to some extent when a fuse block with porcelain cover was brought out, and it was this idea that gave rise to the development of the inclosed fuse of the plug and cartridge types.

### PLUG FUSES.

The earliest form of inclosed fuse was the Edison plug fuse. It consisted of a short length of lead alloy fuse wire mounted in a porcelain cup with a mica cover. The contacts were the same as the medium-size base for incandescent lamps. The type now in use is only slightly modified from the original design.

The plug fuse is not considered very accurate or extremely reliable because of the short length of fuse wire. It is rather expensive, although considerably cheaper than the non-renewable inclosed cartridge fuse.

Plug fuses are made in various sizes up to 30 amperes capacity for use on 125-volt circuits or on 250-125-volt three-wire systems. They are used extensively in panelboards for branch circuits and in individual cutouts of small capacity.

### DEVELOPMENT OF CARTRIDGE FUSES.

The first cartridge fuses for light and power circuits were placed on the market about the year 1887. They consisted essentially of fiber tubes provided with ferrules and connectors at each end. The fusible element occupied the center of the tube and was soldered to connectors. The tube was filled with a non-inflammable material—asbestos or other compounds—which was designed to quench the arc formed when the fuse "blew." On arcing some of the metal of the fuse link was vaporized and the filling compound absorbed or chilled and condensed

this vapor so that it was rendered non-conducting and the arc thereby extinguished. Vents were provided in the end caps of the larger sizes of fuses to relieve the internal pressure when the fuse blew.

Instead of using a lead alloy for the fusible element it was found that a zinc alloy gave better performance because it was more accurate in rating and left cleaner terminals when fused.

### Manufacture and Use of Cartridge Fuses.

Cartridge fuses received the approval of the Underwriters' Laboratories and rules calling for their use were inserted in the National Electrical Code. They replaced the major portion of the open-link fuses in use.

The advantage of a fuse of this type was that the manufacturer could accurately label it with the fusing current since the conditions of operation were practically determined by the maker. By varying the distance between terminals for different sizes of fuses part of the danger of using a fuse of incorrect capacity was eliminated.

However, the expense of installing a new fuse every time one blew brought forth a great temptation on the part of users to refill them. Another drawback was the necessity of maintaining a stock of fuses of different capacities, and to users of a limited number of fuses this was quite an inconvenience. Many electricians, especially in industrial plants, provided themselves with fuse wire or other material and took their fuses apart and refilled them or they would bridge the terminals of the fuses on the outside of the cartridges and destroy their real function. Manufacturers also made a practice of taking back fuses of the higher ratings and renewing them for a nominal charge in their factories, but because of the inconvenience and delay in securing return shipments, this practice was not adopted by users of fuses to any great extent.

**A. L. Eustice.**

As president of the Economy Fuse & Manufacturing Co., Mr. Eustice played the leading part in the renewable-fuse controversy just ended and which resulted in the approval by the Underwriters' Laboratories of renewable fuses.

### Development of Renewable Cartridge Fuses.

The use and abuse of non-renewable cartridge fuses in the field led up to a demand on the part of consumers for a fuse with a readily renewable element at a moderate cost. Experiments prior to 1912 by a number of inventors finally resulted in the placing of renewable fuses on the market. The construction of these fuses was substantially the same as those of the non-renewable type, except that the ferrule connections could be easily removed from the cartridge and a new fuse element could be connected to the ferrules when the fuse was renewed.

The early development of the renewable fuse was more in the way of securing mechanical means for readily replacing the fusible element than in improving the electrical characteristics of fuses. There was, in general, no departure from the size and shape of the fusible elements. The economy and convenience was evident because lengths of accurately calibrated fuse strip or quantities of fusible links could be carried in stock at small expense. Consumers were quick to see the advantage of using renewable fuses on circuits subject to frequent overloads or short-circuits, and the field for a fuse of this type was considered a large one.

### Relation of Fuses to the National Electrical Code.

In common with other electrical devices it was desirable to manufacturers of renewable fuses that their products receive the approval of the Underwriters' Laboratories and their use sanctioned by the National Electrical Code. The reason for this is that whenever wiring and electrical devices are installed in a building upon which fire insurance is issued it is necessary to conform to the rules of the Code, which is issued by the National Board of Fire Underwriters at the recommendation of the National Fire Protection Association and which is in effect in the United States and Canada.

The Code gives definite rules for the installation of all kinds of wiring and also specifies the kind of material (wire, wiring devices, conduit, fuses, etc.) which may be installed. The National Board of Fire Underwriters maintains the Underwriters' Laboratories, where various fittings and materials used for electrical installations are tested. Inspectors are also sent to the factories where the wiring devices are made to see that the material is manufactured according to the standards adopted.

All materials which pass the tests are "approved" for installation under the Code rules. Unless a device is included in the list of approved material it cannot bear the Underwriters' Laboratories' label or be used where the Code rules must be followed.

### Renewable Fuses Submitted for Approval.

Accordingly, in 1912, several renewable-fuse manufacturers submitted samples of their products to the Underwriters' Laboratories for test. In some instances the tests proved satisfactory and the matter of approval was referred to the Electrical Committee of the National Fire Protection Association, as indicated by the following statement on the cards issued by the Underwriters' Laboratories:

> "Present rules and requirements of the National Electrical Code do not permit the use of cartridge inclosed fuses with readily renewable elements. The general question of the use of such devices has been referred to the Electrical Committee of the National Fire Protection Association."

The interpretation of Rule 68*d* (now 68*c*) of the National Electrical Code proved to be the basis for non-approval of renewable fuses. This rule states:

> "The fusible wire must be attached to the terminals in such a way as to secure a thoroughly good connection and to make it difficult for it to be replaced when melted."

Renewable fuses were designed to make it easy to replace the fusible wire, and it was the word "difficult" as well as the interpretation of the words "a thoroughly good connection" that resulted in the manufacturers of renewable fuses being unable to secure approval of their product.

### Influence of Non-Approval on Marketing Renewable Fuses.

Just what non-approval of renewable fuses meant in establishing avenues of sales for them may be gained from the statement that renewable fuses would not be permitted on any electrical installation coming under the inspection of the National Board of Fire Underwriters and of the many municipalities maintaining inspection departments of their own.

When the renewable fuse was first introduced inspectors were prejudiced against it, mostly because it was not an approved device and partly because they did not think it would stand up under service conditions. A few years later it was found, after inspectors had learned that properly constructed renewable fuses gave satisfactory performance in service, that the best opinion in the inspection field seemed to welcome a reliable form of renewable fuse as a solution of the problems that were being constantly encountered in dealing with fuses.

Since most renewable fuses met the requirements of the Underwriters' Laboratories as to rating and performance, fuse consumers felt that there was evident need for a fuse of this type.

In industrial plants, where unavoidable conditions cause frequent blowing of fuses, it was desirable that renewals be made at moderate cost; if this could not be done improper fusing was bound to be the result.

Records of many electrical jobbers showed that repeat orders for standard non-renewable fuses were not received to any great extent after the first order, showing that many fuses were not being replaced by new units but were refilled. It stood to reason that they were refilled in an improper manner in many cases.

The denial of the use of the renewable fuse seemed to result only in the temptation to defeat the object of a fuse. It was thought that inspection in no way could be made broad enough to correct this defect in the working of the Code rule.

### Non-Approval of Renewable Fuses Protested.

The matter of approval or non-approval of renewable fuses was in the hands of the Electrical Committee until the latter part of 1912, when it was referred to the Switch and Cutout Committee, one of its subcommittees, for consideration. Representatives of the Economy Fuse & Manufacturing Co., which had received favorable reports from the tests on its fuses, appeared before various meetings of the Switch and Cutout Committee in an effort to obtain favorable consideration in connection with the approval of renewable fuses. However, the subcommittee's report to the Electrical Committee, at its meeting in 1913 for revision of the Code, was unfavorable to the approval. In view of the importance of the matter and at the request of a representative of the Underwriters' Laboratories the committee was enlarged so that full and impartial consideration might be given to the matter.

During the period from 1913 to 1915 the question was brought before the committee at different times by representatives of the Economy Fuse & Manufacturing Co. But at the 1915 meeting of the Electrical Committee the report of the Switch and Cutout Committee was as follows:

> "It is the opinion of the committee that experience had not yet shown that fuses in which the fuse element is intended to be replaced or renewed by the user are satisfactory in test or in field service to a degree warranting the recognition of the principles of refillable fuses in the rules of the National Electrical Code."

### Bureau of Standards Acts as Arbitrator.

Following this report the Economy Fuse & Manufacturing Co. filed a protest with the Underwriters' Laboratories and also with the Executive Committee of the National Fire Protection Association at its 1915 meeting, which received the report and recommendations of the Electrical Committee. The outcome of these protests was that in May, 1915, both parties to the controversy agreed to refer the matter to the United States Bureau of Standards, asking the latter to act as arbitrator and decide the following question:

> "Has it been shown that the use of the fuses manufactured by the Economy Fuse & Manufacturing Co. results in no greater fire or accident hazard than the use of other inclosed cartridge fuses at present listed as standard by the Underwriters' Laboratories?"

In presenting the argument for the Economy company it was stated that many of the fuses listed as standard were in reality so designed and constructed as to permit of ready refilling and that the printed labels calling attention to the fact that they were refillable by the maker induced the inexperienced public to attempt doing the same.

Reports were submitted showing that renewable fuses were being used in comparatively large quantities in all parts of the world. Affidavits from municipal and insurance inspection departments were presented to indicate the usages and abuses of standard inclosed cartridge fuses. In addition, the field experiences and opinions of a large number of "Economy" fuse users were introduced.

The Bureau of Standards conducted tests and field investigations in relation to the matter, and under date of Dec. 1, 1916, made this finding, which is included in a 200-page report known as Bureau of Standards Technologic Report No. 74:

> "It has not been shown that the use of the fuses manufactured by the Economy Fuse & Manufacturing Co. will result in no greater fire

or accident hazard than the use of inclosed cartridge fuses at present listed as standard by the Underwriters' Laboratories.

"On the other hand, the evidence in the case does not show that the use of 'Economy' fuses has on the whole resulted in any greater fire or accident hazard than is involved in the use of standard inclosed cartridge fuses.

"In comparison with fuses listed as standard by Underwriters' Laboratories, the fuses at present manufactured by Economy Fuse & Manufacturing Co. have been shown to possess certain features which tend to increase the hazards involved in the use of fuses, and other features which tend to reduce such hazards. The relative importance of these features can be determined only by extended experience under working conditions.

"It is therefore recommended that 'Economy' fuses be not approved at present for general use on the same basis as fuses at present listed as standard by Underwriters' Laboratories, but that a continuation and extension of their use be permitted by municipal and underwriters' inspection departments under conditions where their performance can be observed by each inspection department until sufficient experience regarding their performance under service conditions can be obtained to justify an unqualified approval or refusal to approve."

The decision was taken as favorable by both sides. Definite recommendations for approval by the Underwriters' Laboratories were not made, but the fuse company virtually obtained the approval of the Bureau of Standards. Renewable fuses were recommended to pass inspection, though they were subject to observance as to performance.

Inasmuch as the performance of properly constructed renewable fuses had been satisfactory, the fact that they were recommended to pass inspection had a marked effect on the sales. Because they were substantially standard in construction and because large savings could be effected by use of the renewals in maintaining fuses on circuits that were "blown" often, the sales arguments for renewable fuses proved very forcible.

### Efforts Made to Secure Approval.

However, unqualified approval of the renewable fuse by the Underwriters' Laboratories and change of Rule 68*d* of the Code to permit their use was desirable to the manufacturers. Pressure was brought to bear on the situation when, in March, 1917, a restraining order was obtained by the Economy Fuse & Manufacturing Co. against the members of the Electrical Committee of the National Fire Protection Association, who had scheduled a meeting for the revision of the Code.

The basis of the complaint was that the Electrical Committee had been unlawfully interfering with the business of the Economy company for the preceding five years; that though the plaintiff had sought time and again to demonstrate to the members of the committee the desirability of its fuses and that they had been tested and reported on as complying with the performance required of the National Electrical Code by the Underwriters' Laboratories and the Underwriters' Laboratories had recommended to the committee that the "Economy" renewable fuse was a device meriting their serious attention for recognition, members of the committee had not made any proper investigation of the subject, and though a large number of them had expressed their approval individually they were about to act in concert with other members of the committee to adopt a resolution which, the plaintiff claimed, was in effect a judgment that the "Economy" fuse should not be recognized.

The restraining order was withdrawn several weeks after it was entered and litigation dropped after numerous conferences with officers of the National Fire Protection Association.

In October, 1917, the Electrical Committee passed this resolution in reference to the revision of the National Electrical Code:

"Rule 68*d*. In view of the misinterpretation placed upon the report of the committee in the March bulletin regarding refillable fuses, the committee desires to submit the revised report following:

"On the evidence presented to or obtained by the committee, it does not recommend any change in Rule 68*d*, but presents this report with the understanding that, in order to obtain additional field experience, municipal and underwriters' inspection departments may permit a continuation and extension of the use of such refillable fuses as have in their opinion been shown to comply with the tests specified for standard cartridge fuses and to be suitable for use."

The Code was revised without any change in Rule 68*d*, except that its number was changed to 68*c*, as it now stands in the 1918 edition.

Since that time the popular demand for renewable fuses has been increasing, and this sentiment has been backed up by the satisfactory performance records of properly constructed renewable fuses.

Specifications outlining tests and construction of renewable fuses were drawn up by the Underwriters' Laboratories working in conjunction with the Fuse Section of the Associated Manufacturers of Electrical Supplies. These were approved by the Electrical Council of the Underwriters' Laboratories and issued by the Underwriters' Laboratories in July, 1919. Tests upon manufacturers' samples were begun soon after and formal approval of renewable fuses of several different makes was given through the issuance, under date of Dec. 1, of approval cards listing these products as standard and indicating label and examination service.

This action indicates the removal of practically all opposition to the use of renewable fuses of approved construction and undoubtedly will lead to consideration of the Code rule governing fuses by the Electrical Committee when it meets in March for the revision of the Code.

## HUGE COST OF COAL FOR RAILROADS.

The fuel bill of the United States railroad administration for the year 1919, exclusive of any increase in mine price that may be occasioned by changes in the miners' wage scale, will approximate (including an allowance of 75 cents per ton for company haul) a total of $665,000,000. Unless checked by a decrease unit consumption it will, in a few years, reach the billion-dollar mark.

It seems that there should be considerable incentive to electrify railroads where other conditions permit with reigning coal prices.

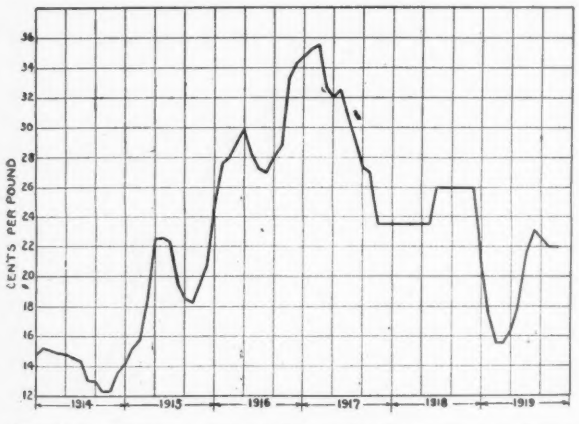
# The Trend of Prices of Electrical Materials

## Review of Market Conditions Since the Outbreak of War, with Price Comparisons of Electrical Products

By HOWARD EHRLICH

The five-year period since the outbreak of the war has presented more business problems than any other period since the beginnings of the electrical industry. Every branch of the industry and every factor entering into the production and distribution of electrical materials has experienced many upsets as a result of the unusual conditions which have governed during that period.

These conditions, especially those involving fluctuations in the costs of raw materials and labor, have been reflected in prices, though not to the extent that a superficial examination would indicate. Economies of production, learned during the war period, have continued and served to react against the upward tendency of prices. The increasing volume of business, with consequent reductions in overhead costs, has also




Monthly Average Cost of Prime Lake Copper in Cents Per Pound.

worked toward the same end. And these are beside the evident desire of electrical manufacturers and dealers, in general, who, in good faith, have endeavored to hold down prices, realizing that without such efforts there would be runaway markets. Taken all in all, so many factors have influenced the readjustments of prices since 1914 that reference must be made to individual commodities in order to get some idea of the prevailing tendencies in each line.

### Conditions Affecting Trade.

It will be remembered that during the year 1914 business was exceedingly dull. Curtailment of purchases was general; it was a buyers' market; prices were low, and most purchases were made on basis of price alone. The influx of war orders did not make itself felt on the electrical trade until 1915, when the abnormal demand for copper and for electrical materials for factory construction stiffened the market and caused the first general increases in prices. The full effect of increased demand for electrical products was not felt until the winter of 1916-17, when prices in general reached high levels. This condition remained practically unchanged until 1918, when the scarcity of labor, due to heavy demands for men for war service, resulted in increased labor costs. Higher wages and the enormous demand for materials for war purposes produced a cumulative effect that placed prices on a level in 1918 that proved to be the maximum during the five-year period.

The signing of the armistice, with consequent withdrawal of orders for war materials, had a pronounced effect on business, and the outlook at the beginning of 1919 was not taken as favorable by electrical manufacturers, especially those making construction materials. These fears proved to be ungrounded, however, for, after a short period of depression during the first few weeks of 1919, the demand caught up with the supply, and any prices that were lowered were again raised to their 1918 level.

Since early spring of this year the market for electrical goods has accelerated in unprecedented fashion. Manufacturers have tried to make their production keep pace but have been unable to do so. They have been hampered by their inability to obtain adequate supplies of raw materials as well as by strikes, by lack of skilled workmen and by a high rate of labor turnover. Even without such setbacks production could not have satisfied the heavy demands.

The pressure for electrical products is unabated. Naturally, the tendency of prices is upwards, although, as stated before, it is evident that producers have been and are endeavoring to hold them down.

### Influence of Raw-Material Costs on Prices of Electrical Goods.

Copper enters so largely into the construction of electrical apparatus that it would seem that prices would be affected to a great extent by copper costs. That such is not entirely the case is shown by the accompanying curve which gives monthly average costs per pound of prime lake copper during 1914-19. The rapid increases during 1915 and 1916 were due to the demand for copper for war materials, and these increases, of course, influenced the prices of electrical materials. Government regulation resulted in a price of 23.5 cents in 1917 and of 26 cents in 1918, but during that time prices on electrical goods were showing a decided upward tendency. The slump after the signing of the armistice is very noticeable; in fact, copper was one of the first in the raw-material markets to be affected by the cessa-

tion of the demand for war materials. Its recovery and maintenance at a level of around 23 cents shows the prevailing inadequacy of supply to demand; in fact, quoted prices are for long-time deliveries, and bonuses must be paid for quick shipments.

The ramifications of the steel market have affected prices of electrical goods not a little. The prices of such material as conduit, fittings, cutout boxes, cabinets, etc., have followed the market closely and consequently there have been many changes. Prices on these have inclined considerably above those of the general run of electrical products. Cast iron has increased somewhat over 100% in price, and it has been supplanted by pressed steel in instances where lessened weight was desirable and where production economies could be secured by use of the latter.

Insulating materials also took to the wings of increasing costs. Prices on such commodities as cotton, silk, mica and paper have jumped to heights never reached before. Some materials, such as rubber, fiber and synthetic compounds, have not shown such large price increases.

### Comparison of 1914-16 Prices with Those at Present Time.

Inquiries from leading manufacturers of the different lines of electrical equipment reveals some interesting information regarding their increases in prices since the low levels of 1914-15-16 were abandoned. While increases have been general, it is surprising to note how moderate they have been in comparison with almost all other commodities. Ranging from 25 to 100%, with an average of about 60%, prices on electrical materials show a gratifying absence of profiteering that is a testimonial to manufacturers who have managed to keep prices down by effecting economies of production and distribution, and these in the face of higher overhead, material and labor costs on the one hand and a heavy demand market on the other.

The percentage increases given below represent the estimated average increase since prices began to experience upward tendencies, this period extending from 1914 to 1916. During the past year prices on electrical products containing a large percentage of copper or steel have experienced a number of changes, but on other products prices have remained firm at the 1918 level.

PERCENTAGE INCREASES IN PRICES OF ELECTRICAL MATERIALS SINCE 1914-16.

| | |
|---|---|
| Batteries, dry | 75 |
| Batteries, storage | 50 |
| Cabinets and cutout boxes | 80 |
| Conduit, interior | 100 to 150 |
| Electrotherapeutic apparatus | 10 to 25 |
| Fans, electric | 75 |
| Fiber | 50 |
| Fittings, conduit | 80 to 200 |
| Fixtures, industrial lighting | 70 |
| Fixtures, residential lighting | 60 |
| Fixtures, office lighting | 60 |
| Flashlights | 25 |
| Flatirons, electric | 100 |
| Furnaces, electric | 25 to 100 |
| Fuses | 25 |
| Grills, electric | 100 |
| Heating pads, electric | 60 |
| Instruments | 25 to 30 |
| Lamps, incandescent | 25 |
| Lamps, incandescent miniature | 50 |
| Motors | 60 |
| Panelboards | 80 |
| Plugs, attachment | 50 to 75 |
| Pole-line material | 30 to 50 |
| Poles, wood | 25 |
| Ranges, electric | 50 to 100 |
| Receptacles, flush | 50 to 70 |
| Reflectors | 70 |
| Signs, electric | 35 |
| Sockets | 50 to 75 |
| Switchboards | 65 |
| Switches, knife | 50 |
| Switches, snap | 50 to 100 |
| Table utensils, electric | 75 to 100 |
| Transformers | 40 |
| Vacuum cleaners, electric | 50 to 75 |
| Vibrators, electric | 25 to 50 |
| Washing machines, electric | 40 to 60 |
| Wire— | |
| Lamp cord | 100 |
| Rubber-covered | 55 to 85 |
| Magnet (see copper-base curve). | |
| Weatherproof | 100 |

## MUCH ELECTRICAL MACHINERY DEMANDED ABROAD.

**Fuel Shortage Forces Europe to Use "White Coal" —Good Opportunities for American Electrical Manufacturers.**

The great increase in the price of coal throughout the world has made fuel economy a most pressing problem. Reports reaching the National Foreign Trade Council denotes a tremendous and continued opportunity for the American electrical manufacturing industry in supplying the needs of these countries which are now forced to develop their electrical power to the utmost.

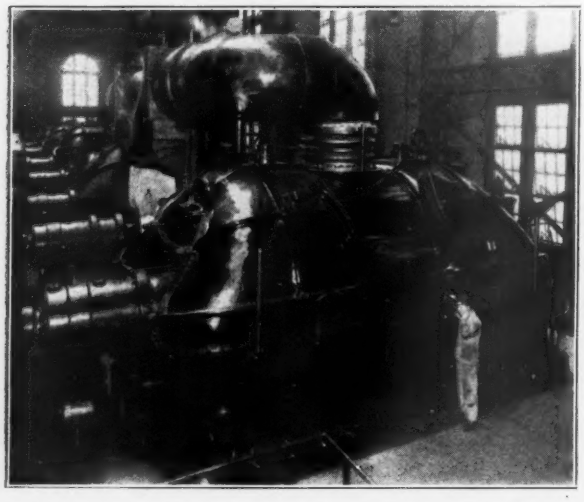
Large railroad electrification projects are soon to be carried out in Italy and South Africa. In the former country 800,000,000 lire will be spent for electrification of 3726 miles of railroads. Portugal will probably follow in Italy's footsteps. Many of the South American countries are studying this problem, and Bolivia has just declared as public domain the watersheds of the rivers having sufficient power for that purpose. Throughout Chile many power plants are being built.

In France a bill recently has become law for the canalization of the Rhone from Lake Geneva to the Mediterranean. The swiftness of the current of this river will be modified by means of a series of locks and dams, the latter being utilized to generate electrical energy and for irrigating purposes. Nineteen large generating stations are to be provided which will furnish from 12,000 to over 70,000 hp. per station. It is estimated that the river is capable of generating energy equivalent to 760,000 hp., which is equal to a saving of nearly 500,000,000 tons of coal. Two hundred thousand hp. of the energy generated is reserved for the use of consumers in Paris at the price of 2 cents per kw-hr. (locally generated energy now costs 10 cents). The balance of 560,000 hp. will be utilized by metallurgical, electrochemical and other industries in the Rhone valley, for electric traction on the Rhone, for the electrification of a portion of the Paris, Lyons & Mediterranean Railway, pumping irrigation water, etc. The cost is estimated at over $400,000,000.

# Year's Achievements of Westinghouse Company—Part I.

## Review of Developments—Improvements in Apparatus a Contribution to Varied Fields

With the placing in operation of the largest turbogenerating unit ever built; the delivery of the electrical equipment for what will be the world's greatest electric furnace installation; the breaking of the record for size in the construction of electric locomotives; the export shipment of the electrical apparatus for what will comprise the first electrically-driven steel blooming mill to be erected in the Far East; the completion of the design for a transformer of higher rating than of any that has yet been manufactured; the beginning of work on the installation of a hydroelectric generator of uncommonly high capacity; and many other successsful achievements, the 1919 resumé of the Westinghouse Electric & Manufacturing Co. presents numerous outstanding features.



70,000-Kw., Three-element, Cross-compound Turbogenerator.

Not only have large-scale operations with standard apparatus been undertaken and successfully accomplished, but many new types have been brought out and placed on the market. And the progress, in addition to developing along lines of increased capacity and higher rating, has proceeded in directions where a need for smaller size and a saving of space has arisen.

### Steam Turbine Generating Units.

A notable installation is the 70,000-kw., 25-cycle, three-element, cross-compound unit placed in service during the past year at the 74th Street Station of the Interborough Rapid Transit Co. of New York City. The unit is rated at 60,000 kw. continuously, or 70,000 kw. for 2 hrs. and is, therefore, the most powerful prime mover in the world. It has three elements, one high pressure and two low pressure, and it is the first triple cross-compound turbine to be placed in operation.

The new unit occupies a floor space of 52 by 50 ft. and is about 19 ft. high. The high-pressure element receives steam at 205 lbs. gauge pressure, superheated 150 deg. F., and exhausts it into the low-pressure elements at 15 lbs. gauge pressure. The two low-pressure elements are identical in construction and each receives one-half of the steam from the high-pressure element and exhausts it into the condenser where a 29-in. vacuum is maintained. All three elements operate at 1500 r.p.m. and each drives a generator rated at 20,000 kw. continuously, 23,500 kw. for two hours, and 30,000 kw. for a half hour. The generators deliver three-phase, 25-cycle, 11,000-volt alternating current.

The purpose of this huge machine is to assist in meeting the greatly increased demand for transportation in New York City, due to the opening up of a new subway system and the extension of the service of the existing subway, elevated and surface lines.

Another especially notable turbine unit, similar in design and capacity to the one just described but for 60-cycle current, was installed at the United States Government Nitrate Plant Number 2, at Muscle Shoals, Ala. This unit was secured by the government and shipped to Muscle Shoals for the purpose of producing nitrates used in the manufacture of gunpowder. In this case, the high-pressure element operates at 1800 r.p.m. and the two low-pressure elements at 1200 r.p.m. The three generators are of the same capacity.

A new application of the turbine is in the role of "house turbine" which is now assuming an important place in large power stations. This is exemplified at the U. S. Government nitrate plant in a 2500-kv-a., non-condensing, 3600-r.p.m. unit, the exhaust of which is used to heat the feed water. Just enough load is placed on the unit to obtain the desired heat balance.

### Condensers.

The Westinghouse Co. has completed the largest jet condenser it has ever built. The condenser is capable of passing 13,000,000 lbs. of water per hour and was built for the Alabama Power Co.

Several large surface condensers have been manufactured during the year, of which a 45,000 sq. ft. condenser built for the Cleveland Electric Illuminating Co. is a good example. This is of the Westinghouse radial-flow design and was built to serve a Westinghouse double-flow turbine.

### Alternating-Current Generators.

The past year has witnessed considerable activity in both hydroelectric and steam station development, but with a few exceptions, the ma-

jority of these installations have followed along well-established lines in both capacity and design features. Among the company's activities along this line the following have been of interest.

There is being built for the Southern California Co. a 15,000-kv-a., 600-r.p.m., 50/60-cycle, frequency-changer set for their Richgrove substation. The distinctive features of this set are: First, its capacity, this being one of the largest units of its type thus far to be built; second, the voltage, the motor and generator being designed for 15,000 and 18,000 volts normal operation, respectively.

There is also nearing completion a 32,500-kv-a., 12,000-volt, three-phase, 25-cycle, 150-r.p.m., vertical hydroelectric generator which is being built for the Niagara Falls Power Co.

### Stokers.

During the year 1919 a number of important changes in the Westinghouse underfeed stoker have been made. The need for high coal burning capacity per unit of width has been met by furnishing a stoker having 21 tuyeres equipped with a deeper ash collecting arrangement and steam power dump mechanism.

The fuel of the West, usually designated by the broad term "Western fuel," has always required special attention. The Westinghouse Co. is now offering a modified type of 17-tuyere underfeed stoker with this fuel which has been very successfully used. It has two outstanding features:

(1) The drive of secondary ram is arranged to give a more positive control over the lower portion of the fuel bed.

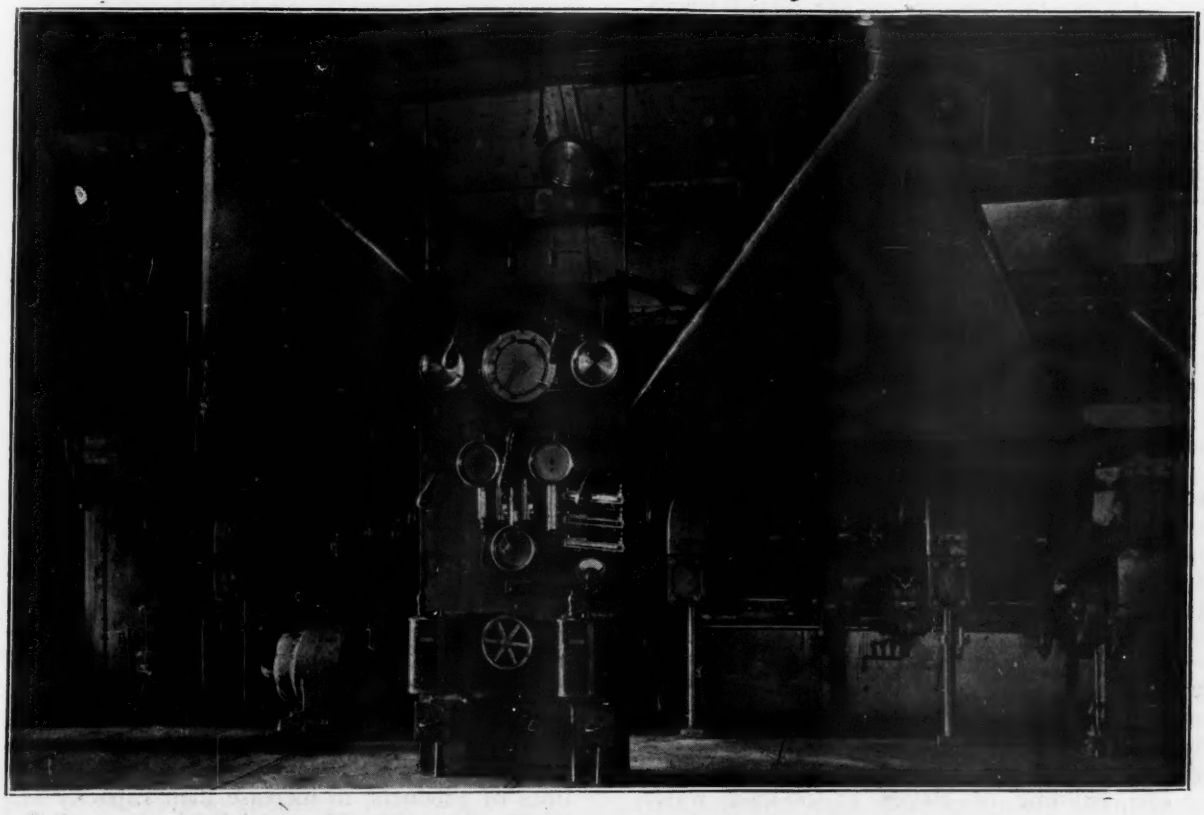
(2) The often present side wall clinker trouble has been overcome by installing a set of sloping tuyeres at each side of the stoker which combine the function of supporting the fuel, furnishing a requisite amount of air and protecting the walls to the full depth of the fuel bed.

Considerable study has always been given to the problem of supplying the correct amount of air over the fuel bed as well as through it. Experiments have shown that each air distributing box located in the front wall at the top of the line of tuyeres was most positive in its action if it was a unit in itself. All types of Westinghouse underfeed stokers will in the future be furnished with air distributing boxes with closed ends. This will make a series of air chambers instead of one long chamber across entire width of the stoker.

A number of important installations of mechanical stokers have been made during the year some of which contain unique features.

The West Penn Power Co. in its power plant at Springdale, Pa., is installing four 1529-hp. boilers, each equipped with two 13-retort Westinghouse underfeed stokers, opposing each other, and delivering the ash to a clinker grinder. An interesting feature is that the ash pit is sealed by carrying it down below the level of the water in the Allegheny river. It is intended to remove the ashes from the pits by bucket-conveyors. This arrangement, in addition to sealing the ash pit, furnishes a novel means of quenching the ash.

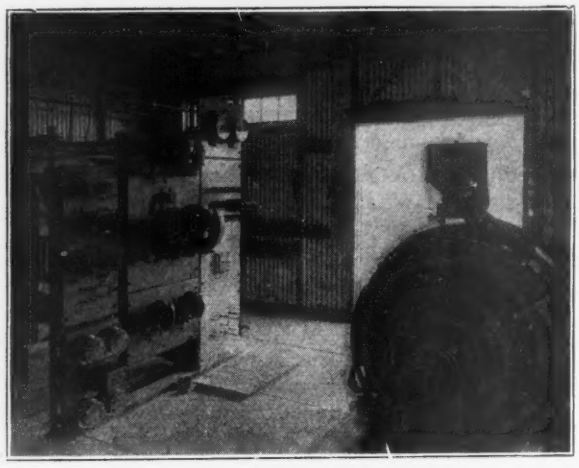
At Cheswick, Pa., the Cheswick Power Co. is building a power house, the boiler room of which will have 28 boiler units of 2087 rated hp. each, or a total of 58,436 rated hp. The first seven of these units are to be installed now, each equipped with a 17-retort, 21-tuyere, underfeed stoker having a clinker grinder. This is the widest stoker the company has yet built. The boilers are 51 tubes wide, and 18 tubes high. The determination of the size of the units was



View of Typical Modern Fuel-Burning and Combustion-Controlling Equipment.

only made after careful investigation of the financial aspect of the situation by the Cheswick Power Co.'s engineers. It was found to be more desirable to use the wide boiler with single end stoker equipment, than the narrower boiler with a double fire.

It will be interesting to watch the operation of these two plants when they are both in oper-



View of Automatic Substation.

ation, as they will use practically the same coal, carry similar loads, and have the same makes of stokers and boilers. The only difference will be that the West Penn installation is planned to operate at boiler ratings of from 250% up, while 175% will be the normal operation of the Cheswick plant.

The National Tube Co., McKeesport, has installed two 12-retort stokers under two 1471 hp. boilers. The stokers are of the 21-tuyere type and have an additional feed wedge on the secondary rams to take care of the added length of the fuel burning area.

Up to the present time, steam engines have made the most satisfactory stoker drive and have been the most widely used. To care for the increased pressure at which power plants are now operating, the Westinghouse Co. is developing a compound engine similar to the standard 8x10 x8 engine, but of less horsepower. This engine will be a 4x6x4 and will supersede three present types of stoker engine. The new engine will operate on steam pressure up to 300 lbs., and up to approximate temperature of 600 F. The cost and steam consumption will be from 10 to 20% lower.

### Transformers.

The outstanding features in transformer design for the year 1919 have been chiefly a matter of size of units. There was completed during the year, a number of 8333 kv-a. self-cooled transformers. These are the highest rated of the self-cooled type built to date. They are for 66,000-volt service.

The design has also been completed for a 23,600-kv-a. water-cooled transformer for 132,000 volts. This is the highest rated transformer yet attempted, and in physical size it will be considerably larger than its nearest rival.

The building of eleven 11,500-kv-a. water-cooled transformers for 150,000-volt service is being completed. These transformers are designed for 72,000 volts low tension, and for delta connection on the high tension line. These extraordinary voltages, both high tension and low tension result in a transformer of a size exceeded only by the 23,600-kv-a. type to which previous reference has been made.

All of the transformers mentioned in the foregoing paragraphs are of the shell type, and in all cases were chosen for their ruggedness and reliability, which was a most essential factor as they are to be used in extremely important positions on operating systems where continuity of service is of paramount importance.

An improved line of distribution transformers, has been brought out, the chief advantage being a reduction in weight of over ⅓ by the substitution of a welded sheet-steel case for one of castiron.

### Substations.

The fundamental scheme of automatic switching, which is dependent entirely upon the electrical condition of the machine, has demonstrated not only its sufficiency but its superiority. The principal developments during the year have been in improving various relays for greater ruggedness and accuracy. Great strides have been made in simplifying the equipment, which has done a great deal to popularize the automatic switching.

The developments in synchronous converters have consisted in improvement of details, the most important development being the greatly improved collector rings, which are specially cast, and are provided with an improved method of alternating current collection. During the year, service tests to determine the value of oscillators were completed. They indicated that the oscillators should be omitted. This feature is, therefore, being omitted from standard Westinghouse synchronous converters and improved results are accordingly being obtained.

The compensating winding has been incorporated in the design of all of the generators of the larger motor-generators. The use of this winding has considerably improved commutation over that of the machines having only commutating poles. The compensating winding, in addition to the commutating poles as incorporated in the recent designs, is particularly valuable from an operating standpoint on very heavy peak loads.

### Industrial.

In the readjustment of manufacturing conditions since the war period, much study has been given to the improvement of quality of product, increase of production and reduction of cost. The two main factors to be considered are labor and power economy. The electrification of industrial plants has done more to better conditions of manufacturing than any other single improvement. During the war period, the value of this type of drive and its many incidental advantages were readily appreciated when plants were being remodeled to meet the various conditions of war requirements, and the speed with which plants were changed over to produce new lines of products, to increase their capacity and in other ways to add materially to the flexibility

and mobility was really marvelous. In fact, without electric drive it is doubtful if such results could have been obtained. Much has been done during the past year, 1919, to add to the advantages of electric drive and to improve the details of the design of apparatus.

Though step induction regulators have been built for some time to provide a means of varying the voltage through a wide range for electric furnaces and other processes, it is only recently that much progress has been made in this line of apparatus. During the last year the Westinghouse Co. has supplied more than 30 step regulators for transformers, of 1500 kv-a. capacity and larger, and when compared with limits of capacity of the usual type of regulator, 200 to 300 kv-a., there is evidently much progress.

The use of the electric arc as a practical and economical method of fusion of metal in manufacturing processes has extended so rapidly during the past two years that new types of equipment have been developed to meet the particular requirements of the service. Although the arc welding process has been used for years on special applications, for repair work, and in general foundry work on repairing defective castings and similar applications, its economy in replacing riveting and other means of fastening metals, in general manufacturing processes, has only lately been realized. The tendency is toward units of a capacity large enough for one operator only. These units may be stationed about the shop or yard at points where they are to be used or are readily made portable so that they can be moved to the point at which work is to be performed.

Experience has shown that the arc characteristics necessary to secure proper fusion and penetration of the deposited metal call for a generator which will supply a constant current at the arc. A special arc welding generator has been developed which supplies this constant current, thus allowing welding to be done at constant heat, without the use of resistance in the welding circuit. The characteristics of the generator are such that it is not only easy to strike and maintain the arc but the current is maintained constant regardless of the variation of arc resistance which always occurs due to variations in metal being welded, the possible dirt or inequalities of surface and the operator's ability to maintain a constant arc length.

This special arc-welding generator when mounted on common shaft and bedplate with either alternating or direct current motor equipped with its control panel and motor-starting switch, and supplied with other necessary accessories such as operator's hood and metal electrode holder, forms the complete equipment. The panel is simple, compact and light in weight and consists only of rheostat, voltmeter, ammeter and knife switch mounted upon a small panel. When it is desired to make up a portable equipment the entire motor generator set with its control panel is mounted on a structural steel, roller-bearing truck. The complete equipment is light and can be readily transported from one part of the shop to another.

The tendency in the use of multiple equipment is for welding shops where a number of operators are used and where it is easier to carry the work to the welding shop than to carry the welding equipment to the work. These multiple operator sets also find a wide application in places where there are a number of operators working at points close enough together so that it is not necessary to run extremely long welding circuits. Experimental work is being carried on continuously with the arc welding process and its field is rapidly being extended in the welding of high carbon steels and non-ferrous metals.

### Pumping.

The most notable point noted in the development of the pumping industry during the past year has been the trend of the requirements to low-speed motors. Just recently quite a number of orders have been received calling for these very slow speed machines. This is due primarily to the popularity of the screw pump which has many advantages in irrigation work, principally where the head is under 14 ft. and where the head is going to vary to any extent. These pumps, therefore, are ideal for large quantity, low head lift and they require in all cases very slow speed machines.

Another notable development is in connection with the vertical wound-rotor motor in a majority of the frames used. The centrifugal type of pump which generally takes a high-speed motor has also gained in popularity. The usual development for this type of pump has been progressing throughout the year.

### The Automobile Industry.

The automobile manufacturers, always large users of electrical equipment, are adapting electrical apparatus in their shops to many new uses, including the welding of many automobile parts as well as the testing of automobile engines and chasses.

Special machines, capable of acting equally well as a motor or as a generator, and special automatic control equipment have been developed for use in testing engines and assembled cars. The load may be automatically varied according to any given cycle and when the car drives the testing equipment as a generator, it delivers a load which simulates the conditions of a road test.

### Small Motors.

There has been an enormous demand for small motors principally in connection with motor-driven machines for domestic service, such as washing machines, ironing machines, vacuum cleaners, sewing machines, dish washers, etc. This demand has been due to the great shortage of labor and the ability of many individuals to buy these machines, who in years past were unable to do so. The manufacturers of these devices, generally cannot meet the demand. There is a large call also for these devices in export fields and in Canada.

In respect to development along the lines of new designs of motors, this work has been carried on so actively in the past that no great progress has been made during the past year. It is true, however, that more and more attention is being given to the correct application of these

motors and, in this field, much constructive work is being done by engineering talent. Also, a great deal of thought is being given to the development of entirely new motor-driven machines, as well as a redesign of old ones to improve their characteristics of operation and adapt them to quantity manufacture.

In the agricultural field, there has been a considerable impetus in the use of central station power. Groups of farmers are clubbing together and arranging for a joint circuit which gives them all the advantages of the city man. To an even greater extent electric farm units are being used. The most popular size and type is that of a direct connected unit employing a gasoline engine direct connected to a 1-kw. 32-volt generator with a control panel mounted thereon. A lead battery is mounted separately. The unit is self cranking and arranged so that it will automatically stop after a predetermined length of run. These units are used principally for lighting, but also for the operation of small motor-driven machines, particularly house pumps, washing machines, churns, cream separators, sewing machines, etc.

### Industrial Heating.

The Westinghouse Co. has been experimenting for the past 18 months with electric ovens for the baking of bread, pies, cakes and pastries. Recognizing the superiority of a revolving type oven of small capacity, such as would be suitable for hotels, cafeterias, public institutions, as well as for the public bakery, experiments were started to determine the possibility of applying heaters to this type of oven, and to determine the advantages of electric heat. After exhaustive experiments the company has produced results incomparably better than heretofore obtained with any other type of oven or with any other form of heating.

The main advantages in the operation of this oven will be the means of automatic temperature control whereby the temperature can automatically be maintained constant for an indefinite period. A minimum of attention is required for the operation of the oven. After an ovenful of products are baked the operator can open the door and remove the contents, knowing that they are completely and uniformly baked, even though he has given but little attention during the baking. The products remain moist much longer than when baked in other ovens or with other forms of fuel.

An important development in connection with industrial heating has consisted in standardizing on three sizes of ovens to be used primarily for the baking of railway armatures. Exhaustive tests have been made by one of the large railway companies using Westinghouse equipment in competition with steam and gas, and it has been found that with the use of the electrical equipment they secure results that were heretofore unobtainable. They are furthermore assured that the increased life of the armature, due to the proper baking will many times offset the cost of electric power and apparatus. The saving in labor and the elimination of the human element in the control of the ovens is therefore a tremendous factor in making electrically heated armature baking ovens far superior to steam or gas.

Steam has been used in the past for baking of the ink on metal sheets, such as used in the design of bottle tops, tobacco cans, shoe polish cans, etc. From 2½ to 3 hrs. were required in producing a bake. During the early part of this year experiments were made to bake the lithographed tin sheets electrically, after which an order for a large installation was secured. It was found that by using an oven of proper design the baking period could be reduced from 2½ hrs. to 25 minutes, or to one-sixth of the time formerly required. The ease with which the heaters could be located at exactly the desired points for producing the best results, the use of concentrated heat under high air velocity and the automatic temperature control were all contributing factors in making this application a success. An entirely new system of ventilation has also contributed to their efficiency.

In the lithographing of paper, such as used for labels on tin cans, wrappers for chewing gum, etc., the sheets, which are approximately 30 in. square, are stacked in large piles immediately after being printed. The sheets coming off the press are carried around a circular drum and dropped into a pile directly below the drum.

For the purpose of drying the ink after the sheets are printed, the company applied their standard steelclad heaters to the drum. The heaters are mounted on spider connected to the axle of the drum and slip rings are used to carry the current into the heater. The application has been decidedly successful and has not only reduced the number of spoiled sheets, but has greatly shortened the amount of time required for production.

To produce clean, smooth castings from molds made with metal patterns, it is essential that there be no sticking of molding sand to the patterns upon removal from the sand. The collection of moisture largely responsible for this difficulty can be prevented by heating the pattern.

To accomplish this purpose the company has successfully applied their standard steelclad heater. A large number of these applications have been made with satisfactory results. It has been found, in every case, that the cost of equipment and the power is entirely negligible in comparison with the advantages secured.

Standard steelclad heaters have been used in large numbers for the heating of molding machines used in the manufacture of bakelite products, and it has been found in all cases that the superiority of electric heat over steam is very pronounced. The saving in rejected material also contributes in large measure to the success of the heaters used for this purpose.

One of the newest applications consists in applying steelclad heaters to molding machines used in the manufacture of radiator caps for automobiles. A single press will mold 16 radiator caps at one time, each press being equipped with eight steelclad heaters rated at 625 watts each. With a machine thus equipped, the production is increased 16 times over the former method and the percentage of rejections is reduced to a minimum.

*(To be continued)*

# Notable Power Developments in 1919 by General Electric Co.

## A Brief Review of Some Important Advances in Heavy Power Equipment and in Installations Made During the Past Year

By B. R. CONNELL

*Power and Mining Engineering Department, General Electric Co.*

During the early part of the year there was very little activity on hydroelectric projects due to the war and general economic conditions. A few small plants were installed and additions made to existing stations to take care of increases in load that could not be handled otherwise. But by the middle of the year the activity in this line became marked in the number of requests for complete new stations, this being more particularly noticeable in the West.

Among the new and larger projects for which the General Electric Co. has received orders are included the Niagara Falls Power Co., the Southern California Edison Co., Great Western Power Co., Consumers Power Co., and the New England Power Co.

Late in 1918 the Niagara Falls Power Co. started work on a new station to provide power for war-time needs and since the signing of the armistice work has progressed so that some of the units are now practically installed. The General Electric Co. furnished for this development one generator rated 32,600 kv-a., 150 r.p.m., 12,000 volts, 25 cycles together with a number of H-9 oil circuit-breakers and other apparatus. This is the largest generator in point of rating of any waterwheel generator so far built and was designed with special reference to reliability and high efficiency.

The next important step in the increase in transmission voltages has been taken in the new Caribou development of the Great Western Power Co., which is installing equipment and transmission lines for operation at 165,000 volts. Three units are included in the initial order, the ultimate capacity of the station being six units. The generators are rated 22,222 kv-a., 171 r.p.m., 11,000 volts, 60 cycles and are of the horizontal type. Two transformer banks are to be installed each consisting of three single-phase units rated 7500 kv-a., 11,000 to 165,000 volts and Y-connected in the high-tension side. The main control switchboard is of the benchboard type with separate auxiliary boards for the voltage regulator and station service equipment. Two 600-kw. motor and waterwheel-driven exciter sets are also included.

The Southern California Edison Co. has for some time been making estimates on developing various projects to take care of its rapidly increasing load and has finally decided to install its Kern River No. 3 development. Orders were placed with the General Electric Co. for the complete electrical equipment of this installation. Two units are to be installed at present, the generators being rated 17,500 kv-a., 600 or 500 r.p.m., 11,000 volts with direct-connected exciters; these generators are designed so as to be capable of operation at either 60 or 50 cycles. Seven transformers are included, rated at 5833 kv-a., 10,000 or 11,000 to 75,000 volts and Y-connected on the high-tension side. Complete switching equipment consisting of high and low-tension switches and benchboard type of main control board was also included. At the Eagle Rock substation a 3000-kv-a., 600 r.p.m., 6600-volt synchronous condenser is to be installed complete with transformers, exciter sets and switchboard equipment.

The Consumers Power Co., Jackson, Mich., has recently placed an order for a large frequency-changer set as an additional tie between its 30-cycle and 60-cycle systems at Battle Creek, Mich. This is the largest frequency-changer set yet built, being rated 10,000 kw. The set can be operated to exchange power in either direction between the two systems. Three 30-cycle, 5000-kv-a., 140,000 to 7500-volt transformers and switching equipment are included.

The New England Power Co. is making additions to its Vernon power plant, including two 6000 kv-a., 75 r.p.m., 2300-volt, 60-cycle generators with direct-connected exciters; two three-phase 6000-kv-a., 2300 to 72,000-volt Y-connected transformers and the necessary switching apparatus. The high-tension switches will be installed out of doors.

### Steel-Mill Equipment.

During the year there has been added approximately 40,000 hp. in normal continuous rating to the existing capacity of main roll drives installed by the General Electric Co. in steel mills.

During April the electrical equipment for driving a 40-in. reversing blooming mill at the Sparrows Point plant of the Bethlehem Steel Co. was put in operation, and has been in successful service since that time. This equipment has a double-unit reversing motor with a normal continuous capacity of approximately 2000 hp. at 50 r.p.m. and a momentary torque capacity of approximately 2,000,000 lbs-ft. at any speed from zero to 50 r.p.m. Power for driving this blooming mill motor is furnished by a flywheel motor-generator set consisting of two 2000-kw., 375 r.p.m. generators driven by a 3000-hp., 660-volt induction motor with a 50-ton flywheel.

During the early part of the year a 36 by 110-in. plate mill was started at the Fairfield works of the Tennessee Coal, Iron & Railroad Co. This mill is driven by a 4000-hp., 82 r.p.m., 6600-volt induction motor with a direct-connected fly-

wheel. The 45-in. blooming mill for this installation has an electrical equipment which is the largest reversing blooming-mill equipment in this country, the mill being driven by a double-unit reversing motor with a normal continuous capacity of 5600 hp. at 55 r.p.m., having a momentary torque capacity of 2,300,000 lbs. at 1 ft. radius at any speed from zero to 50 r.p.m. Power for this motor is supplied by a motor-generator set consisting of three 2000-kw., 360-r.p.m. generators and one 4000-hp., 6600-volt induction motor with a 50-ton flywheel.

An order has also been received for an electrical equipment for a 40-in. reversing blooming mill for the Tata Iron & Steel Co., in India. This equipment is very similar to the 45-in. blooming mill at the Fairfield works just described.

### Mine Hoist Equipment.

The Chicago, Burlington & Quincy Railroad Co., during the latter part of the year, placed in operation a notable hoist equipment at its coal mine operated by the Valier Coal Co. The hoist motor is 1350 hp. direct-connected to a single-cylinder drum on which two ropes wind for balanced operation with two self-dumping skips. Power for the motor is supplied by a 1000-kw. flywheel motor-generator set.

A noteworthy feature of this installation is its semiautomatic operation, as the trip may be started either by an operator on the hoist platform in the usual manner, or by the skip tender at the bottom of the shaft, and is automatically retarded and brought to rest, stopping accurately at the dump and at the loading chute.

The rope speed of this installation is 1500 ft. per min., which is a considerable advance over the previous automatic hoist equipment supplied to the Inspiration Consolidated Copper Co., which hoist operated at 750 ft. per minute.

Successful operation of these two installations shows the possibilities of a more general adoption of automatically operated hoists in mines.

Ten induction-motor-driven mine hoists have been placed in operation at the Noris-Aurora mines of the Oliver Iron Mining Co., the installation consisting of five 875-hp. ore hoists and five 400-hp. man hoists. This installation is particularly noteworthy on account of the system of safety devices used and also on account of the fact that it is probably the largest aggregation of induction-motor-driven hoists in a single mining operation.

### Electric Furnace Equipment.

During the year there has been considerable activity in the electric furnace field with the number of installations steadily increasing. The general tendency has been to increase the size of the furnaces, although there has also been a demand for furnaces of small sizes for certain classes of work. The most noteworthy increase has been in the number of furnace equipments supplied for brass and other nonferrous metals.

There has been a movement on the part of some power companies towards limiting fluctuations and more especially the power-factor of loads which are connected to their lines. To meet this, protective apparatus is being developed and also various types of apparatus for power-factor correction to offset the low power-factor incident to furnace loads.

### Electric Welding Equipment.

There has also been a very marked activity during the year in equipment for arc welding work, and the General Electric Co. has developed a new generator known as the WD type, which can be either belt-driven or direct-connected to gas engines or other power available. A large number have been ordered.

These generators are especially designed to obtain in one machine all the characteristics demanded by arc welding service. This is obtained without the use of external ballast resistance or separate excitation from any external source. Neither a separate circuit nor direct-connected exciter is used. Since the machine provides its own excitation, the voltage characteristic is such that throughout the proper working range of the arc the energy delivered is practically constant. The voltage and current follow the momentary variations in the arc conditions practically instantaneously and consequently the lag between change in arc conditions and resulting corrective change in electrical conditions is reduced to a minimum. This lag is one cause of trouble in welding with self-regulating welding equipments, whether the automatic feature is embodied in the revolving apparatus or mounted on the panel.

The generator is so wound as to give a no-load or striking voltage of 60 which, when the arc is struck automatically, decreases to the voltage required by the arc. This voltage is from 18 to 20 for the average operator and average good work. A longer arc is undesirable, since poor work is liable to result. Skilled operators on smooth work are sometimes able to hold a very short arc with a voltage as low as 16, but in rating the generator the value of 20 is used. By adjustment of the dial switch on the panel, the current may be adjusted from a maximum of 200 to a minimum of 75 in 25-ampere stops. The approximate current values are plainly marked at the different steps on the dial switch.

One of the recent developments in electric welding with the metal electrode is that of an automatic machine. This machine is arranged to automatically control the feed of the electrode wire and control current and is either moved over to the work or the work moved relatively to it. This is useful for the manufacture of tanks, sheet-metal work, various automobile parts, such as rear axle housings, oil barrels, and the like. It has also been found useful in building up worn shafting that has been incorrectly machined. By its use a great deal of incorrectly machined material can be salvaged, as this is really an automatic "putting on tool," which is now available for use in the metal industries.

One of the most noticeable trends in the line of switching apparatus during the past year has been the development in the safety-first type and the dead-front lines of switchboard material for which there is a great demand. A large number of truck-type equipments have also been supplied, especially for industrial service, and the truck-type oil circuit-breaker has also been extended to the larger FH-3 type, for which a number of orders have been filled.

# Salient Facts Concerning Service to Farming Communities

## Methods of Obtaining the Farming Load — Comparative Costs of Utility and Isolated Plant Service—Unit of Cost on Kilowatt-Hour Basis

By H. W. YOUNG

*President, Delta-Star Electric Co., Chicago.*

For some time the writer has been conducting an investigation of the farm line situation and has come to the conclusion that the apathetic attitude of many central-station managers is simply due to a lack of appreciation of rural electrical possibilities.

Coupled with this is the fact that the farm service problem has been handled more or less in an individual manner rather than tackling it as a group proposition. For example, the manager of a utility surrounded by rural communities frequently has individual requests from farmers for electric service. Estimates are then made up as to the cost of lines and the result is discouraging to all parties. But if the central-station manager will make it his business to investigate the possibilities of a given farming section he will find many farmers who want and will co-operate to get central-station service.

### Securing Farm Business.

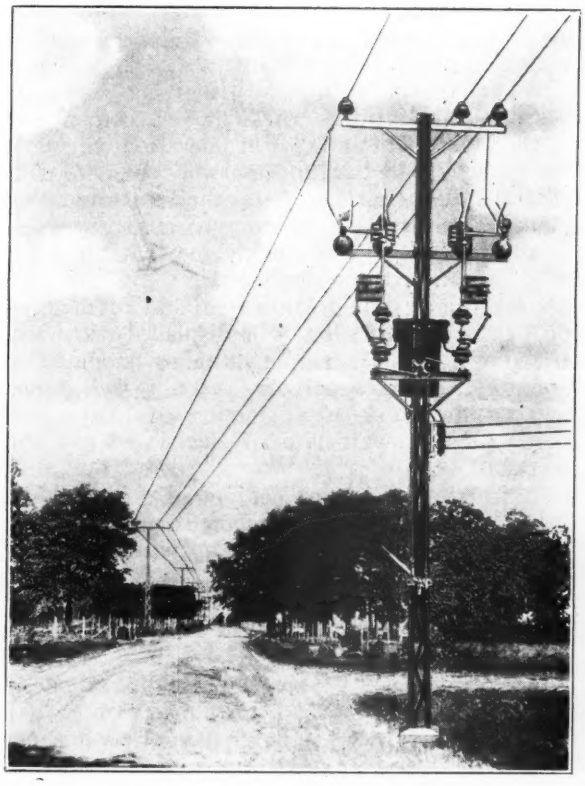
A logical method of securing farm line business by the group system is for the utility manager to send out a circular letter or advertise in the local papers the fact that central-station service can be given by what is known as the "Service Certificate Plan." By this plan a group of farmers purchase service certificates which give them the right to secure service from a transmission feeder line to be built along an agreed route.

The price of these service certificates will, of course depend upon the required line investment and the number of farms to be connected. For example, a 6-mile, 6600-volt line built in accordance with central-station standards will cost approximately $6000.00. If 30 farmers want service each will pay $200.00 for his service certificate. The installed cost of switching, fusing, choke coil and lightning arrester equipment complete with a 5-kw. transformer will approximate $400.00, making a total cost of $600.00 for each farmer. If a 3-kw. or other capacity transformer is decided upon, the cost will be correspondingly affected.

The money paid for the service certificate is used to build the lines, which become the utility's property, the equipment at each installation belonging to the farmer. The rates for service will be based on the utility's standard practice with such additional charges necessary to cover maintenance of lines and transformer core losses. Several suggested forms of contracts for farm line service have been prepared by the writer for the different conditions to be met.

Eliminating for the time being the fact that farmers prefer central-station service to that secured from an individual plant and that a 3 or 5-kw. transformer permits power applications not possible with a 1-kw. battery and generator set, the following data will be of interest:

Assuming that a 1-kw. isolated plant can be purchased for $500.00 and neglecting the installation costs, including the necessary housing, the following figures on total expense of current for one year are obtained:



A Modern Farm Power and Lighting Equipment.

| | Annual expense. |
|---|---|
| Interest at 6% on $500.00 investment of plant... | 30.00 |
| Average consumption of gasoline or kerosene.. | 15.00 |
| Annual expense of storage battery (average life of storage battery three years, the renewing of which would cost $150.00)..... | 50.00 |
| Total expense of current for one year..... | $95.00 |

The question now arises: What does the farmer get for this $95.00 charge per year? With a 1-kw. plant, power can only be used in a very limited way and the average use for light

will approximate 10 kw-hrs. per month or 120 kw-hrs. per year. This results in a cost of 79c per kw-hr. for current actually used. Even though the farmer should use 20 kw-hrs. per month, the cost per kilowatt-hour for current used is still very high as compared to the average rates for central-station service.

The true value of electric service is obtained, not when trying to see how few kilowatt-hours can be used but how many can be profitably used and this emphasizes the real value of central-station service. Lighting alone is not what the farmer wants; he also wants and needs power service. The majority of farmers have automobiles; many have tractors and trucks; all have machinery of some kind. This means that a certain amount of repair work is necessary and this in turn requires a repair shop on the farm. Electric power costs but a fraction of the cost of man power and this results in the use of motors which must be supplied with current.

With central-station service, the farmer also has plenty of power to operate his water supply, the milking machines, grinding feed or elevating silage, operating the cream separator and many other applications which would be impossible with the small isolated plant.

Where the group method of giving service is possible—the farmers' rural line—a comparison of the investment and cost of operation will show that isolated plants cannot possibly compete with central-station service. If the central-station manager will realize the value of electric service to the farmer he will quickly see that the farm lines are an economic necessity.

Farm labor is high, is scarce, and often independent. Much of it can be displaced with electric power. For example, it takes one man to operate a cream separator, yet a ⅛-hp. motor will do the work at a fraction of man-power cost. One kilowatt-hour of electric energy will work and churn from 160 to 170 lbs. of butter at a fraction of a cent per pound. It takes 13 men to exert 1 kw. and if a man is paid 30c per hour, his services then cost approximately $4.00 per kw-hr.

The average farm horse works approximately 11½% of the time or 2⅔ hrs. per day on the average throughout the year. A horse working 8 hrs. per day can only accomplish approximately two-thirds of mechanical horsepower or ½ kw. If the horse works 3 hrs. per day, or 90 hrs. per month on the average throughout the year, it will accomplish 45 kw-hrs. per month. Neglecting all investment charges, depreciation and losses by death and sickness, and assuming the farmer's hay costs $10.00 per ton and oats 40c per bushel, the monthly feed costs approximately $7.00 per horse. This means that one kilowatt-hour costs 15½c. In actual practice, it is much more under present costs of horse, feed and labor.

Such comparisons are frequently of interest to central-station managers in that they make them realize the great possibilities of electric service on the farm. The field has as yet scarcely been touched and is a fertile one for revenue. For example, a town residence may bring in a revenue of $3.00 per month and the central station stands the entire investment for lines, transformers, etc. A farmer's bill may average $6.00 per month, but in addition he pays for lines, the transformer, the equipment, will read his own meter and mail the record card to the central station.

Another angle to the farm line service is that it develops a new field to sell central-station securities. More and more utilities must secure local buyers for their securities. Farmers have money to invest and by giving them electric service the utilities have a new and powerful form of publicity or advertising. A utility with a large number of local investors in the farming communities will not only obtain a good financial connection but when the questions of rates, rights-of-way, etc., arise, its difficulties will be less than if farmers were not interested in a financial way.

Farm line service is today really an important subject from a national standpoint. It concerns the farmer with his far-reaching influence on public policy. It concerns the utilities seeking both reserve and good will. It concerns the manufacturer of electric equipment and appliances. It concerns the jobbers, dealers and contractors seeking to expand their business.

The farm market is here, equipment is available, several methods for handling the business have been developed. All that is now needed to get this new load for the central station is some real merchandising spirit, not an apathetic or negative policy.

## REVISION OF CODE RULES ON HOUSING OF MOTORS.

At a recent meeting of the Electric Power Club its Underwriters' Committee made a report on proposed revisions of the National Electrical Code. Rule 8*f*, which refers to the housing of motors and which recommends the use of a closed type of motor in dusty places, was among the rules considered. As a result of this ruling an additional charge for insurance on risks where motors are not inclosed is being made in certain sections of the country. In the case of squirrel-cage induction motors such extra charge is not believed to be warranted, and the committee drew up the following proposed amendment:

"Motors having brushes or sliding contacts exposed to combustible dust should be placed in flash- or semiflashproof rooms or inclosures provided with ventilation to outside clean air. The room should be as dustproof as possible and large enough to make the motor accessible. A room is recommended for all motors exposed to combustible dust.

"A wood framework lined with metal lath and cement plaster or ¼-in. hard asbestos board, with door metal-clad and provided with wire-glass window (for observing the motor) and cement-covered floor is considered the most practical form of room. Lighter inclosures of asbestos board are suitable for motors when mounted on ceilings."

The amendment was passed unanimously by the Club and has been referred to the Electrical Committee of the National Fire Protection Association with the recommendation that it be incorporated in the revision of the Code.

# Editorial Comment

## Electrical Industry's Retrospect and Prospect

Both custom and logic have made the beginning of a new year a fitting time to look back on the progress achieved and, noting the trend of developments, to look forward with some confidence at the prospect for the future. Thus we again devote a large part of this first issue of the year to reviews of achievements of the electrical industry in the past twelvemonth and to picturing a view of the outlook. These reviews speak for themselves; only a few general comments on affairs electrical need be made here.

The electrical industry has passed through the readjustment year with much more success than many other industries and, with the exception of only one of its branches, is in better condition than probably ever before. There is a bigger demand for its services and products than ever and yet the prices the public must pay for these services and products have been raised much less than in nearly all other industries. Electric light and power service rates have not been raised at all in many cases—one of the very few exceptions to the substantially universal price increases of the last few years. Electrical apparatus, appliances and supplies have not increased in price as much as most other commodities, as is shown in a special article in this issue. The industry's status is therefore generally much more stable and much less speculative than is the case in other industries that have enjoyed exceptional prosperity through extremely abnormal prices. Prospects for the future of the electrical industry are therefore unusually bright. Let us, therefore, all put our shoulders to the wheel so that they may be fully realized.

## Co-ordinating Heating and Electricity Supply

Conservation is at best a relative term, and this is unfortunately very true when applied to fuel conservation. Central stations are helping to conserve fuel in the production of kilowatt-hours, because they are able to manufacture electricity, *per se*, more efficiently than isolated plants. Upon a heat-unit basis, however, central station operation is not efficient, and speaking of fuel conservation in this connection immediately becomes a very relative, even an ironical, expression.

To permit production of kilowatt-hours with a lower consumption of heat units, central stations are going to higher steam pressures and are operating at vacua within a fraction of an inch of absolute. And the need for higher thermodynamic efficiency is bringing about many changes and refinements. Meanwhile the method of producing kilowatt-hours continues in the same old way.

The conversion of energy from chemical energy to electrical energy is highest when allowing the full expansion or heat extraction from the steam. This means maintenance of high vacuum. Unfortunately, high vacuum means that a large portion of the heat is lost to energy transfer from thermal to electrical energy, and this heat is usually lost to usefulness in that it is allowed to pass into the river or to the sewer unutilized. About half the total available heat is lost in this way. Under such conditions—operating conditions representing the acme of present-day central-station operation—what does the term "fuel conservation" mean?

If instead of going into the sewer or the river the heat units that cannot now be changed from thermal to electrical energy could be utilized, the total amount of heat utilized immediately becomes many times greater, more efficient, based on ratio of heat available to heat used. When this condition obtains, fuel conservation becomes more of a fact and less of a fiction, surely!

So long as half and more of the total heat is allowed to go to waste, central stations cannot claim to be conserving fuel. Fuel will only be conserved, and the statement is relative only in any case, when there is very much less discrepancy between the heat produced and the heat used. In producing the kilowatt-hour, the large loss or waste occurs in converting the energy from one form to another, heat energy to electrical energy. By supplying heat as heat, as well as in selling electricity, kilowatt-hours, the central stations could make fuel conservation a fact, increase their revenue, abate smoke and do untold good for themselves and the people in other ways.

Elsewhere in this issue appears an article that is deserving of careful thought by central-station interests. The question of district heating is not a new one, of course. It is an old one. But it is a matter that has assumed a new aspect, and a very important aspect, of late. Conditions have changed radically during the last couple of years, and these circumstances that combined to

the disadvantage of district heating ten years and more ago are now combined to its immense advantage.

District heating should be a business, not a hobby. It is a solution to special problems; not a panacea to all central-station problems. For district heating to pay, district heating must first of all be feasible. It must, secondly, be scientifically carried on, which means proper construction and operating methods must be adopted, and equitable rates for service must be charged. In the past, too, many and sometimes all of these requirements for success were lacking and failure resulted.

The article above referred to deals with the old subject of supplying heat in a new way. It attempts to point out that existing conditions place an entirely new complexion upon district heating. The saying that the looker-on sees most of the game is often true and one cannot help but feel that in striving to obtain a low water-rate—minimum pounds of coal or steam or water per kilowatt-hour—the central-station fraternity have rather forgotten that there is need in the world for heat as well as electricity. Only by supplying both can the central stations make fuel conservation an accomplished fact; and only by so doing will they be able to come up to the sacred responsibility that is theirs. And there is no time like the present.

## *Rural Community Transmission Lines*

Farmers in proximity to territory served by the central station are an asset which the central stations as a whole have not yet fully realized. The farming and rural community offers a large source of revenue from the sale of current. They represent an important field for the sale of securities. The farming community is one that deserves cultivation, and serious cultivation; not haphazard and half-hearted cultivation, but sound, serious, sane and aggressive cultivation.

The farmers' and the rural transmission line has in the past too often proved a liability instead of an asset. Sometimes transmission lines were built where they ought not to have been, as a closer and a complete investigation would have shown. However, the chief reason for failure has been, not that the transmission line should not have been built, but that it should have been built differently. And the charges for rural or farmers' service should have been different.

Elsewhere in this issue, H. W. Young gives some farm facts for central-station managers. He compares the farmers' transmission line serving a community of farmers with the individual isolated farmers' plant. He shows conclusively that the farm lighting outfit is really an only choice—when a transmission line is not feasible.

Electrification of the farm, as other things, leads to a wider use of electricity. The farm-lighting outfit restricts the wider use of electricity because of its size. The farm-lighting outfit is not flexible, whereas the transmission line possesses no limitations. The farm-lighting outfit has much shorter life than the transmission line. As we have pointed out before many times in these columns, the transmission line has its place and the farm-lighting outfit has its place. The farm-lighting outfit should be found only where the transmission line cannot go.

The financial success of a transmission line depends upon the revenue it brings in. There is a limit beyond which first cost cannot be lowered, and the cost should be the lowest compatible with safety and reasonable permanence and sane flexibility. But there exists no such restriction as regards revenue, and the greater the energy consumed the more profitable the line. Low energy rates—which depend upon the investment and the cost of operation—favor higher energy consumption, which means that central-station rates are an important factor in affecting the profitableness of a farmers' line. Mr. Young shows that a 1-kw. isolated plant may result in a cost of 79c per kilowatt-hour, a figure that certainly offers the central station an opportunity to compete profitably; or a condition that makes competition with the transmission impossible.

The man and the horse equivalent of the kilowatt-hour are cleverly shown by Mr. Young and in a way that emphasizes in a startling manner the need for electricity on the farm. Granted that electricity is needed, granted that the central station can supply it cheaper than the farmer can himself produce it, with many other advantages, surely it behooves the central stations within reach of farming communities to go after this form of load.

Linking up the farmers with the transmission line instead of allowing them through force of circumstance no fault of their own to go over to isolated plant appears to be less a matter of selling the idea of electrification to the farmers than of selling the idea of the farmers' transmission line to the central stations. It should be remembered that conditions today are different from what they were a few years ago. Conditions on the farm are different, the methods of serving the farmer are different and the mode of charging them for service is different. The farmers' transmission line and all that goes with it is waiting, not on the farmers, but on the central stations that should supply them.

# Current Events

## General Electric Adopts Insurance Plan for Employes—N. E. L. A. Committee Meetings—Water-Power Development

### EDISON MEDAL AWARDED TO W. L. R. EMMET.

**Medal Committee of A. I. E. E. Makes Award for Inventions and Developments of Electrical Apparatus and Steam Turbines.**

At the meeting of the Board of Directors of the American Institute of Electrical Engineers held Dec. 12, the Edison Medal Committee reported that the Edison Medal for the year 1919 had been awarded to W. L. R. Emmet, "for inventions and developments of electrical apparatus and prime movers." Arrangements will be made for the presentation of the medal to Mr. Emmet at a convenient later date.

The Edison Medal was founded by the Edison Medal Association, composed of associates and friends of Thomas A. Edison, and is awarded annually by a committee consisting of 24 members of the American Institute of Electrical Engineers "for meritorious achievement in electrical science, electrical engineering, or the electrical arts."

BIOGRAPHICAL SKETCH OF MR. EMMET.

William LeRoy Emmet, engineer and inventor, born at Pelham, N. Y., July 10, 1859, son of William Jenkins and Julia Colt (Pierson) Emmet, grandson of Robert and Rosina (Hubley) Emmet, and great-grandson of Thomas Addis Emmet, the first one of the family in America. The latter was the distinguished Irish patriot and leader in the Society of United Irishmen in 1798, and an elder brother of the ideal patriot of the Irish race, Robert Emmet, who was executed in Dublin in 1803. Thomas Addis Emmet came to America in 1804 and soon became a leader of the New York bar. His son Robert was a prominent lawyer and judge in New York City.

Mr. Emmet was educated at schools in Canada, New York and Maryland, and subsequently entered the United States Naval Academy, where he was graduated in 1881. He served as a cadet midshipman until 1883 at Annapolis and on board the U. S. S. *Essex*, and re-entered the navy as junior lieutenant in 1898, serving as navigator on the U. S. S. *Justin* during the period of the Spanish-American war, during which he saw active service.

His principal civil employment has been with the Sprague Electric Railway & Motor Co. and the General Electric Co. He has achieved fame as an electrical engineer and as an inventor and has obtained many patents for inventions in electricity, mechanics and thermodynamics. His most important electrical work has been in the development of the general use of alternating currents and in the invention and design of machinery to further the practical application of alternating currents, while his most important mechanical work has been in connection with the development and introduction of the steam turbine. He designed and directed the development of the Curtis turbine by the General Electric Co., a very large work, every detail of which was radically new, and which was carried on with almost unprecedented rapidity. He designed the machinery for the first ships driven by electric motors, and he was the first serious promoter of electric ship propulsion, conducting a series of experiments with the United States Collier *Jupiter* which were epoch-making. He is the inventor of the vertical-shaft steam turbine of which a very large number have been built, and many details of turbine design in general use are to his credit.

He is the inventor of several types of transformers, including a form of air-blast type which has been extensively used; of several types of insulation of alternators, and of other details which have met with general acceptance. He is the inventor of the oil switch, a device which is now almost universally used in large electrical work. After experimentally investigating the possibilities at Brooklyn and Niagara Falls on the heaviest circuits then existing he was the first to design and use switches of this type. The varnished cambric cable which is widely used is also an Emmet invention.

His principal achievements, however, have been those of an engineer and a pioneer of new methods rather than those of an inventor and much of his most original and most useful work could not be effectively patented nor perhaps even classified as invention. Most of his work has been connected with operations of the General Electric Co. and has been done in close association with other engineers of the company, and he has made it his special business to find new scope for the talents and facilities which that large organization affords.

Mr. Emmet is the author of "Alternating-Current Wiring and Distribution" (1894) and of numerous important papers presented before the American Institute of Electrical Engineers and other engineering societies. He is a member of the American Philosophical Society, American Institute of Electrical Engineers, American Society of Mechanical Engineers, Society of Naval Architects and Marine Engineers, and of the Naval Consulting Board of the United States. He is also a member of the University and Engineers' Clubs of New York, the Mohawk Golf, Tobique Salmon, Mohawk, Edison, and Schenectady Boat Clubs. He received the degree of D. Sc. from Union College.

## GENERAL ELECTRIC CO. INSURES ALL ITS EMPLOYES.

**Every Employe of One Year Service or More Given Life Insurance of $1000 to $1500.**

The General Electric Co. has announced a group life insurance plan for all of its employes. Under this plan every employe who has been with the company one year or more will have a substantial amount of life insurance without cost to himself. This applies to everyone in the employ of the company, regardless of age, sex or physical condition.

This insurance plan will in a measure relieve the minds of employes as to the danger of financial distress in their families in case of death. Officials of the company have long recognized the value of continuous service and it is hoped that the plan will encourage permanency of employment.

The amount of this insurance is $500 for one year's service, $750 for two years' service, $1000 for three years' service, $1250 for four years' service and $1500 for five years' service; this is the maximum policy. The life insurance company with whom the policies have been placed requires no physical examination of the employe as a condition of such insurance, which is provided at the company's expense and became effective on Jan. 1, 1920. The insurance runs for a period of one year but it is hoped that experience will justify its continuance thereafter.

Upon the lives of employes who die leaving no dependents, the amount of insurance is $150, to cover funeral expenses. The insurance ceases as to any employe with the termination of his employment, but the insuring company agrees that insurance on a standard policy form at regular rates may be secured without physical examination upon application to it by the person whose employment is terminated.

The group life insurance plan applies to all the General Electric plants and district offices throughout the country. It is one of the best of the many things the company has done for its employes. Posting of the notice was a welcome announcement to the 23,000 employes in the Schenectady works, where more than 10,000 employes have worked for the company five years or more and a great majority of the remaining 13,000 have served over three years. There are quite a few employes in that and in other plants, however, who have not completed a year's service. These will automatically come within the scope of the plan as soon as they have been with the company a year.

## ELECTRIC CLUB OF CHICAGO SECURES PERMANENT QUARTERS.

**Conveniently Located and Commodious Club Rooms Secured in Hotel Morrison, Chicago.**

By practically unanimous vote at its meeting on Dec. 30, the Electric Club of Chicago decided to engage permanent club rooms on the mezzanine floor of the Hotel Morrison at Clark and Madison streets in the middle of Chicago's "loop" or central business district. This hotel is the newest and largest in the downtown district. A five-year lease has been made for rental of 5600 sq. ft. of floor space at $15,000 annually. The hotel will subdivide and furnish the quarters to provide a reception room, lounging room, library, pool and billiard room, card room, ladies' room, dining room, offices, etc., all of which will be for the private use of the club. Luncheons and dinners will be served directly by the hotel at regular guest rates.

Annual dues will be raised from $5 to $30 for resident members and to $15 for nonresidents. The membership is to be limited to 1000 resident and 200 nonresident members. It is estimated that the annual income will be $29,400 and the expenses $24,500, leaving a surplus of $4900 for contingencies or investment.

At the annual election there were chosen on Dec. 16, the following as officers for the ensuing year: President, C. W. PenDell; first vice-president, W. E. Bischoff; second vice-president, Paul A. Westburg; secretary-treasurer, A. G. Declercq; trustees, H. V. Coffy, Paul W. Koch and C. H. Roth.

## DECEMBER MEETING OF EXECUTIVE COMMITTEE, N. E. L. A.

**Reports of Section Chairmen and Leading Committees Presented—Suggestions on General Activities and Geographic Sections.**

Much business pertaining to the general affairs of the National Electric Light Association was transacted at the meeting of the Executive Committee on Dec. 4, a report of which has just been made available. Vice-president Martin J. Insull presided.

Walter Neumuller, chairman of the Membership Committee, reported that its program is under way with several campaigns well advanced. The committee expects early in the new year gratifying results from its efforts.

Frank A. Birch, chairman, Company Sections Committee, outlined the work accomplished by his commitee, which recommends that a bureau be established at headquarters for the supervision of company section work. A subcommittee of the Executive Committee will study the report of Mr. Birch and report at a later meeting.

Vice-president M. R. Bump reported on the situation as to geographic sections, and submitted a map of the country showing the tentative subdivision into geographic sections. A letter has been sent to all member companies in the districts not already organized, calling attention to the tentative division of the country and asking for suggestions and support. The committee hopes to receive many suggestions and plans to send out another general letter.

M. H. Aylesworth, executive assistant to the president, reported on the rearrangement of offices at headquarters and also on his attendance at the convention of the National Association of Railway and Utility Commissioners in Indianapolis on Oct. 14. He also told what was being done to relieve the shortage of fuel during the coal strike, which was then in progress.

Mr. Aylesworth spoke also of the letter which he sent recently to the executives of Class A member companies, outlining part of the pro-

gram for future activities of the association and asking for suggestions as to how the work could be improved. Hundreds of answers to this letter have been received and they show careful thought. He also urged that greater interest be taken by the executives of member companies in the company section work.

Chairman Symes of the Accounting Section reported that a well attended meeting of the Executive Committee of that section was held in Detroit on Oct. 20. The Accounting Section Committee is ready to confer at any time with the committee from the National Association of Railway and Utility Commissioners on the subject of a uniform classification of accounts.

For the Technical Section, Chairman Moultrop reported that the work is going along smoothly and energetically. Four representatives from the Pacific Coast were present at a recent meeting of the Executive Committee of the section and better co-operation between the East and the West will result.

Chairman Learned of the Commercial Section reported that following the successful series of meetings held in October in Chicago, about ten or twelve meetings are planned to be held in New York City on Jan. 5, 6 and 7. This method of grouping meetings will make for efficiency and minimize traveling expenses.

The committee indorsed the movement for formation of a National Department of Public Works.

## DEVELOPMENT OF WATER POWER URGED BY SECRETARY LANE.

### Points Out Close Relation Between Water Power, Coal and Oil—Conservation Makes All Three Part of Single Power Problem.

In his annual report, Secretary of the Interior Franklin K. Lane urges the prompt development of water powers as a fuel conservation measure. In summing up, he says:

"It would seem to be our plain duty to discover how little coal we need to use. To do this we must dignify coal by grading it in terms not merely of convenience as to size but in terms of service as to its power. We should save it, if for no better reason than that we may sell it to a coal-hungry world.

"We should develop water power as an inexhaustible substitute for coal and if necessary compel the co-ordination of all power plants which serve a common territory.

"New petroleum supplies have become a national necessity, so quickly have we adapted ourselves to this new fuel and so extravagantly have we given over ourselves to its adaptability. To save that we may use abundantly, to develop that we may never be weak, to bring together into greater effectiveness all power possibilities—these would seem to be national duties, dictated by a large self-interest.

"I have gone only sufficiently far into this whole question to realize that it is as fundamental and of as deep public concern as the railroad question and that it is even more complex. No one, so far as I can learn, has mastered all of its various phases; in fact, there are few who know even one sector of the great battle front of power. A Foch is needed, one in whom would center a knowledge of all the activities and the inactivities of these three great industries, which in reality are but a single industry."

## DENVER MEETING OF OVERHEAD SYSTEMS COMMITTEE, N. E. L. A.

### Mass of Valuable Data Collected on Construction and Maintenance Methods, Especially as to Insulator Maintenance.

The Overhead System Committee, National Electric Light Association, held several sessions in Denver, Colo., on three days last month in the offices of the Denver Gas & Electric Light Co. The meeting was well attended by members from both the western and eastern sections of the country.

Reports of the various subcommittees were submitted and it was found that there had been a very gratifying response to the questionnaires issued by them. From the data in hand it was indicated that much interesting information can be collected regarding new construction and maintenance methods and devices. The greatest interest is being displayed in the question of insulator maintenance, so that more information can be collected regarding their operating performance and the necessary remedies can be worked out to eliminate the causes of insulator failures. It was felt at the meeting that a special study should be made of the causes of failures of suspension insulators and that such research should be continued until this part of the outside plant equipment can be depended upon to give continuous and satisfactory results. There were interesting discussions and developments regarding many construction and maintenance details and before the meeting was adjourned a comprehensive plan had been made to develop all of these subjects for presentation in the yearly report of the committee.

## WAR DEPARTMENT'S SALE OF SURPLUS COPPER WIRE.

### Large Quantities of Telephone Cable and Copper Wire to Be Disposed Of.

The War Department authorizes publication of the following statement from the office of the director of sales:

The director of sales, following a conference on Dec. 16, with representatives of wire and cable manufacturers, dealers and distributors, announces plans for disposing of the present available supply of copper wire and cable now held as surplus by the War Department. There are approximately 1,710,000 ft. of telephone cable and 854,923 lbs. of copper wire to be marketed. Proposals for this supply will be received until Tuesday, Jan. 13, 1920, at the office of the director of sales, Munitions building, Washington, D. C.

Two plans for disposing of the material were agreed upon as a result of the conference. These were: First, to request proposals for sale outright, the customer to be permitted to submit proposals for all or any part of the material shown on the list, and, second, to ask for pro-

posals for the sale of all of this material on a commission basis. In the proposals to be submitted under the second plan, the bidders will be required to state the amount of commission to be charged, the method of determining minimum prices at which the sale will be made, and to state the minimum prices at which they will purchase the residue of this material at the end of the time specified in the proposal. Furthermore, the director of sales will pay particular attention to the ability of prospective contractors or dealers to handle transactions of the magnitude of this sale.

Also the director of sales reserves all rights to reject any or all proposals and to continue further negotiations should no satisfactory proposals be received. Under either plan, sales will be made f.o.b. cars, "as is" and "where is."

The greater part of the wire and cable is located in the Philadelphia ordnance district. The remainder is stored at various depots throughout the country. A majority of the material is in excellent condition and packed as originally prepared for overseas shipment.

The approximate quantities and descriptions of the cable and wire are as follows:

1,140,080 ft. 10-pair lead-covered telephone cable.
79,200 ft. 10-pair double wrap paper telephone cable.
599,230 ft. 15-pair lead-covered telephone cable.
680,800 ft. 25-pair armored, lead telephone cable.
34,320 ft. 25-pair steel-armored telephone cable.
100,320 ft. 50-pair lead-covered telephone cable.
2,000 ft. 19-gage cable for interior construction.
5,031 lbs. No. 1 triple-braid weatherproof copper wire.
3,711 lbs. No. 2 triple-braid weatherproof copper wire.
4,489 lbs. No. 4 triple-braid weatherproof copper wire.
3,128 lbs. No. 6 triple-braid weatherproof copper wire.
1,170 lbs. No. 10 triple-braid weatherproof copper wire.
39 lbs. No. 14 hard-drawn tined copper wire.
26,369,000 lbs. No. 17 twisted-pair copper wire.
1,016 lbs. No. 2 rubber-covered double-braid copper wire.
4,116 lbs. No. 6 rubber-covered double-braid copper wire.
8,930 lbs. No. 6 rubber-covered single-braid copper wire.
9,410 lbs. outpost strand, single-braid copper wire.
1,235,695 ft. bare outpost strand.
35,421 lbs. bronze, tinned, 0.014 in.
87,363 lbs. bronze, tinned, 0.013 in.
6,942 lbs. ⅜-in. annealed rods.

## INDUSTRIAL LIGHTING PROSPECTUS ISSUED BY S. E. D.

The Society for Electrical Development, New York City, has issued a 16-page multigraphed prospectus containing facts and figures based upon the results of a survey covering 446 industrial consumers in 57 towns in 15 states, in which a large percentage of the industrial activity of the country is concentrated.

These facts and figures are intended for the use of salesmen in convincing factory executives or superintendents that their plants are in need of better illumination.

With the curtailment of the hours of production every manufacturer in the country is interested in speeding up his plant, increasing production, decreasing spoilage and reducing the number of accidents. Proper illumination will materially help to accomplish these results at a minimum expense. Now, therefore, is the logical time to start a campaign for better lighting.

The prospectus also contains suggested letters to send to prospective customers and some newspaper advertising suggestions. It is sold for 50 cents and is to be followed in the near future with an industrial lighting handbook. The idea of issuing this prospectus is to get something into the hands of lighting salesmen immediately so that everyone may get started now while the time is ripe.

## INDEPENDENT TELEPHONE ASSOCIATION TO CONVENE IN SOUTH.

Because of the unusual conditions the telephone industry has been passing through during the years of the war, resulting in employes enlisting in military service by the thousand, the slowing down of all extensions and development work, the shortage of labor, the greatly increased cost of operation, the depreciated value of the dollar, the period of government control and the many pressing problems confronting the companies, it has been decided to hold a winter convention of the United States Independent Telephone Association at Atlanta, Ga., on Feb. 4-6.

It is expected there will be a large attendance at this convention from the northern states, as it will give many an opportunity, not only to attend a convention which will be helpful in every way, but it will also afford opportunity for recreation with it. The Georgia Independent Telephone Association will be host to the United States Independent Telephone Association and will hold a business session of its association on the afternoon of Feb. 5.

### COMING CONVENTIONS.

American Society of Civil Engineers. Annual meeting, New York City, Jan. 21-22. Secretary, Charles W. Hunt, 33 West 39th street, New York City.

Western Association of Electrical Inspectors. Annual convention, St. Louis, Mo., Jan. 27-29. Secretary, W. S. Boyd, 175 West Jackson boulevard, Chicago, Ill.

United States Independent Telephone Association. Annual convention, Atlanta, Ga., Feb. 4-6. Secretary-treasurer, W. S. Vivian, 19 South La Salle street, Chicago.

National Council of Lighting Fixture Manufacturers. Annual convention, Detroit, Mich., Feb. 9-13. Secretary-treasurer, Charles H. Hofrichter, Cleveland, O.

Oklahoma Utilities Association. Annual convention, Oklahoma City, Feb. 10-13. Secretary, H. A. Lane, 611 State National Bank building, Oklahoma City.

Central Electric Railway Association. Annual meeting, Louisville, Ky., Feb. 26-27. Secretary, A. L. Neereamer, Indianapolis, Ind.

American Electrochemical Society. Annual convention, Boston, Mass., April 7-10. Friday, April 9, joint session with American Institute of Electrical Engineers on "Electrically Produced Alloys." Secretary, Joseph W. Richards, Bethlehem, Pa.

National Electric Light Association. Annual convention, Pasadena, Cal., May 18-21. Headquarters, Hotel Huntington. Acting secretary, S. A. Sewall, 29 West 39th street, New York City.

# New Appliances

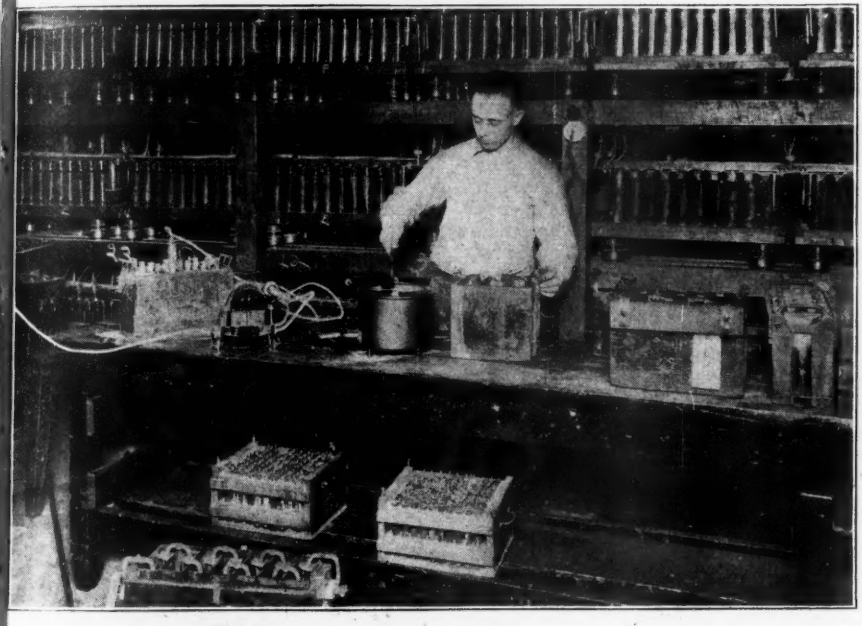
## *Electric Melter—Farm Service Unit—Safety Switch and Fuse Panels for Residences and Cars—Bristol Recorders*

### An Electric Compound Melting Pot.

The General Electric Co., Schenectady, N. Y., has recently developed an electrically heated compound melting pot, for melting battery compound and other compositions of like nature, which should interest garage and repair-shop owners, as well as all others whose business includes the manufacturing and repair of electric batteries.

To such men, the inconveniences and risks of the gas-flame method of melting compounds are the cause of considerable annoyance, due to the loss of time, waste of material and the increased fire risk.

The gas flame is a method of heating that is practically impossible to regulate with any degree of flexibility. It fails to give an even distribution of heat, and is in practically every way unreliable. This together with the hap-



G. E. Electric Compound-Melting Pot in Use in a Large Battery Room.

hazard sort of containers generally in use necessitates the constant attention of the operator. If he is called away and forgets to turn down the flame, the compound owing to its inflammable nature will soon catch fire, resulting often times in considerable financial loss. Or, if the flame is turned down enough for safety, the compound will probably cool so as to necessitate its being remelted, hence, waste of time.

How the new General Electric compound pot by its efficiency, reliability and safety eliminates these dangers and waste, may be best explained by a brief description of the pot itself. The compound pot is made in four-quart size and is solidly built with a bail to facilitate handling. It is provided with a flange around the top that may be made flush with the table. This flange extends over the inside so that the compound cannot boil over the edge, this often being the case when old compound is desired to be remelted inasmuch as old compound is often impregnated with acids. The inner flange also acts as a lip for scraping the compound from the ladle, thus preventing waste.

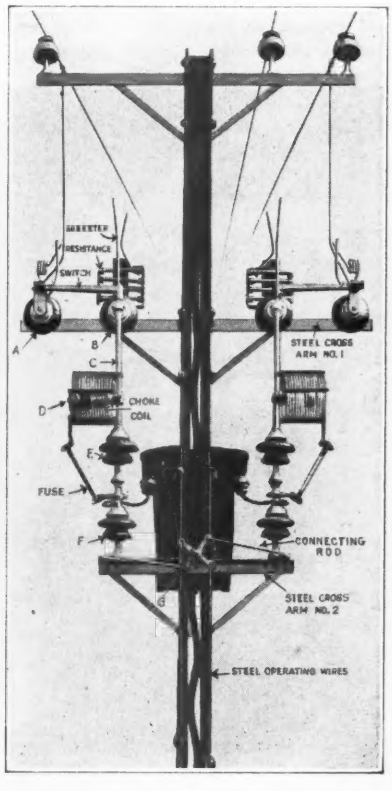
The heat is provided by a three-heat unit of the well-known cartridge type, which is inserted in a slot at the bottom of the pot. This unit is regulated by a three-point plug switch for obtaining three heats. The unit is reliable and does not require any attention of the operator. Many of these units are in use daily and are operating with entire satisfaction.

Thus, a uniform, well distributed heat is assured, and the danger of fire from overheating and of cooling from insufficient heat during the operator's absence is eliminated. If the operator is called away, he may leave the pot without any fear of its contents catching fire and while the heat is sufficient to keep the compound in a molten state, it is not enough to cause combustion.

The pot is as nearly foolproof as such a device can be, which should be a subject of consideration for those familiar with fires caused by the careless upsetting of compound into the flames, or of going away and letting it catch fire through forgetfulness, to say nothing of the waste of compound and the inefficient method of heating in pans, or other equally impractical forms of containers. The General Electric compound melting pot is, on the other hand, clean, portable, economical, durable and eminently safe.

### Unit Type Farm Power and Lighting Equipment.

For a long time there has existed a demand for a self-contained, compact, easily handled and comparatively inexpensive substation to enable central stations to serve farmers and rural communities at low cost. To meet this demand the Delta-Star Electric Co., Chicago, has designed and placed upon the market a simple low-cost switching and protective unit




Delta-Star Farm Power and Lighting Unit.

by use of which farmers along a transmission line may be served at low unit cost.

The outfit is shown in the accompanying illustration, and consists of an interlocked two-pole oil-immersed switch which can be operated from the ground, two lightning arresters with resistors in the ground circuit, two choke coils and two liquid type fuses. The entire equipment is mounted upon two steel crossarms, well galvanized for long life.

The fuses are so located that re-

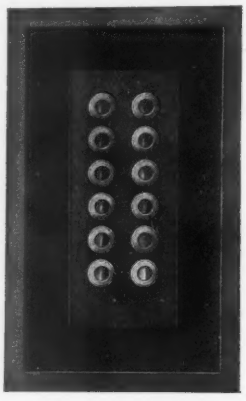
placement is easily done by the farmer, hence eliminating delays due to waiting for the central-station lineman. The unit has been designed for outdoor service and follows the high standard of other Delta-Star equipment. The unit is shipped self-contained, all that is necessary being to set the pole, and fill the switch with oil and connect to the line and service conductors. These outfits are available for any voltages, the unit illustrated being for 6600 to 13,200-volt service. The shipping weight of the 6600-volt unit is 350 lbs. and that of the 13,200-volt unit 475 lbs., weights that permit of ready movement.

## New Safety Push-Button and Fuse Panels.

In order to provide a safety lighting panel of small capacity for apartment houses, residences, etc., the Westinghouse Electric & Manufacturing Co. has recently put on the market its type C safety panel.

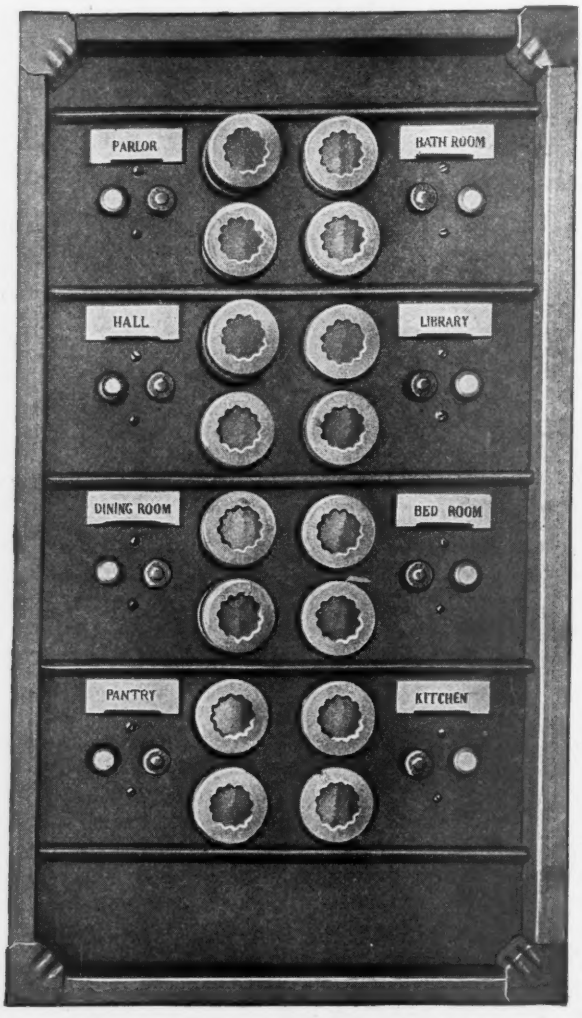
These panels are made up of push buttons and plug fuses and all parts accessible are electrically dead so that the operator is in no danger of getting a shock in turning the lights on or off. Each pair of buttons with their fuses constitutes a unit. Should a switch become damaged, all that is necessary is to remove the switch cover section and unscrew the defective part, without disconnecting any wires, exposing other switches, or removing the panel from the box.

By reason of its construction, this panel is said to be the narrowest safety panel on the market and the only one of its capacity that can be furnished with a safety type main switch, if desired.



Safety Fuse Panel for Residence Use.

These panels are made for two or three-wire systems and for from 2 to 32 branch circuits. The capacity of the main ranges from 30 to 200 amperes, 125 volts, and the capacity of each branch circuit is 10 amperes.




Safety Push-Button Panel for Apartment Houses, Large Residences and the Like.

For apartment or residential use where distributing panels without switches are desired, the company has developed a new type, known as the type F safety fuse panel.

The plug fuse holders of this panel are mounted on a slate base and a molded Micarta cover is provided through which the fuse holders alone project, all other parts being completely covered. When the fuses are in place, therefore, everything accessible is dead so that accidental contact with live parts is impossible. By removing this cover, however, all terminals are exposed so that the installation of the panel and repairs of any kind are very simple matters that can easily be taken care of in a few minutes.

Another feature of this panel is that it is the narrowest panel of its type on the market. It is made for two and three-wire mains of from 30 to 200 amperes in capacity, 125 volts. The number of circuits range from 4 to 32. Main fuses or a safety-type main switch can be added, if desired.

Both these two types of panels meet a demand that has been felt for some time for greater safety in switch and fuse panels.

## Bristol Recording Electrical Instruments.

Realizing that the limitations of older designs of electrical recorders are many and that certain fundamental principles which have been determined in the past few years should be taken advantage of in actual commercial practice, a line of strip chart electrical recorders described below has been designed and is now being manufactured by the Bristol Co., of Waterbury, Conn. Ammeters, voltmeters, wattmeters and frequency meters are included.

Every part of these instruments has been newly designed and no old parts have been utilized, as it was considered essential that every instrument feature should be as nearly ideal as it is possible to make it at the present time. Particular attention has been paid to the cases, which are strongly made, and so designed that warping is impossible. The cases are practically dustproof.

Three types are furnished, for switchboard mounting, wall mounting or portable service, respectively. The switchboard case, when mounted on a board does not show any electrical connections, as the terminals project straight through the back of the case, and serve the purpose also of supporting the instrument on the board. The wall type case is supported by three lugs, and connections are at the side. This model is used where the rear projection terminals would be inconvenient. The portable instrument is supplied with an aluminum case, the base having leveling screws, and for voltmeters or wattmeters requiring external resistance, resistance boxes are attached to the back of the case, making the complete instrument an integral unit. Figs. 1 and 2 show general views of the portable instrument as well as the resistance as attached at the back.

The clock used for driving and rewinding the chart on a roll is a special heavy duty clock. Each clock is supplied with a high-speed shift permitting the immediate change from hour speeds to minute speeds. Speeds are available for 1, 3 or 6 ins. per hour or the same speeds per minute. Fig. 3 shows the gear plate which may be changed in a very few seconds. One gear plate for each hourly speed may be supplied making it possible for the user to secure any speed on the clock, at will.

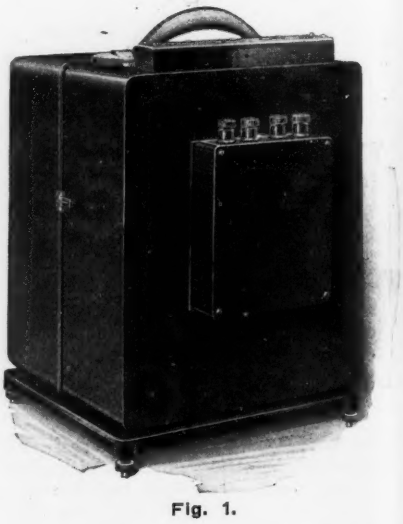


Fig. 1.

Damping is accomplished by magnetic means, or with oil. The a-c. dynamometer D'Arsonval type instruments are usually magnetically damped. On d-c. dynamometer instruments, the oil damper is utilized to avoid disturbances in the magnetic field of the instrument coils which the magnetic damper would cause. Figs. 4 and 5 show the magnetic and oil dampers, as applied to the dynamometer type of movement. A locking device is furnished on each dynamometer type of electrical movement so that the coils may be lifted off the bearings during shipment. The D'Arsonval instrument is short-circuited electrically by simply placing a piece of copper wire across the binding posts.

The instruments are designed to record directly upon paper without the assistance of auxiliary relays, motors, contactors or solenoids, in this way attaining greater accuracy as regards time and magnitude of what is being recorded. The Bristol recording instruments are therefore very accurate.

A dynamometer type of movement is used for the a-c. voltmeters, consisting of two stationary coils, as well as a movable coil fastened to a steel shaft, rounded and polished at its lower end. It is supported on a sapphire end-stone jewel, being guided by a ring stone. The upper bearing is also guided by a ring stone. This construction insures a moving element having an infinitesimal amount of friction, and with the required degree of strength.

The three coils are connected in series, the current being led into the moving coil by two oppositely wound bronze springs, which also serve as the control. The self induction of this movement is so small that it can be used on any frequency from 25 up to 133 cycles and on any wave form with an accuracy within 2% of the scale range. When used on the frequency for which it is adjusted the accuracy is better than 1% over the entire scale range. The power consumption on a 110-volt circuit is less than 15 watts. The chart graduations follow strictly the law of squares.

The D'Arsonval permanent magnet type of movement is used with the d-c. voltmeter. The movement is large, having a sufficient torque to accurately control the recording arm, which rests continuously on the chart, avoiding the use of a vibrating device, as is necessary with instruments of weaker construction, in which it is not possible to have the pointer rest continuously on the chart.

An accuracy within 1½% of the scale range is assured with these instruments. The power consumption on a 110-volt circuit is about 1.5 watts. The chart graduations are uniform along the arc covered by the recording arm.

The dynamometer type of movement may also be used on direct current, although it is not especially recommended for this service, owing to the fact that it is especially designed for alternating current, and the D'Arsonval movement described above is of so much better design for direct-current service. However, when the dynamometer type of instrument is used on direct current an accuracy within 2% of the scale range will be secured at any point on the chart.

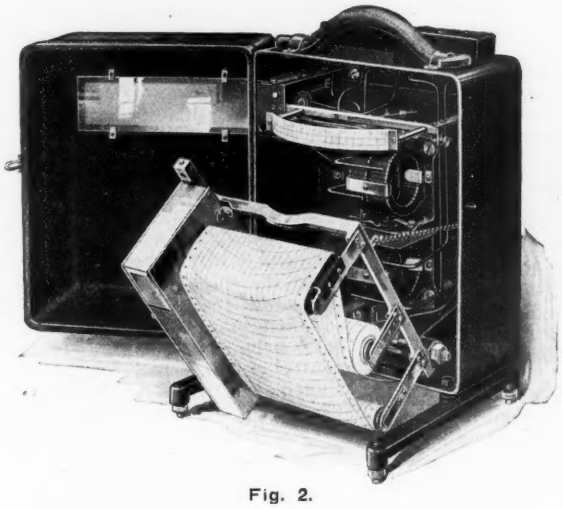


Fig. 2.

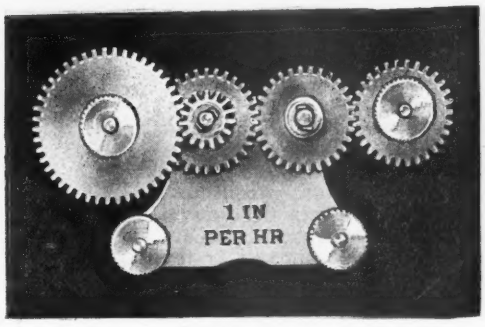



Fig. 3.

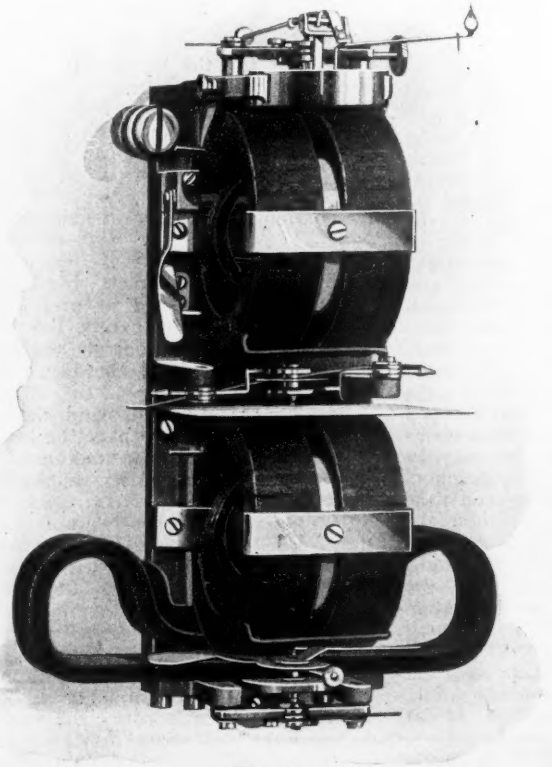


Fig. 4.

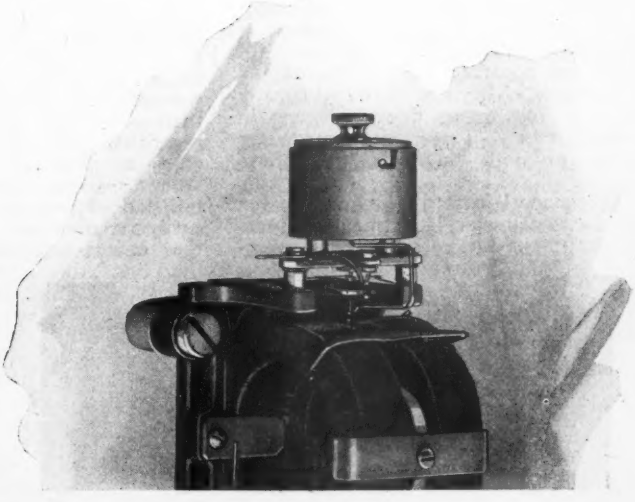


Fig. 5.

A construction very similar to the dynamometer type voltmeter, is used for the a-c. ammeter, the chief difference being in the method of winding the coils, which necessarily employ very different sizes of wires. This recorder, however, is somewhat of a new departure from ordinary practice. As a movable coil is used with control springs to lead the current into this coil, it follows that the springs cannot carry 5 amperes, for which standard instrument transformers are wound. The movement is, therefore, wound to carry one ampere and a small current transformer, ratio 1 to 5, is mounted inside of the instrument, thus making it a standard five-ampere recorder. This method eliminates errors due to shunting the movable coil and makes possible a very powerful movement with a small power consumption.

An accuracy of better than 1½% of the scale range is obtained, with a power consumption of less than 10 watts. The chart graduations follows strictly the law of squares.

The d-c. ammeter of the D'Arsonval type is similar to the voltmeter. It is designed for use with shunts having a 100 millivolt drop. The power consumption of this movement is only about 0.005 watt. The chart graduations are uniform along the arc followed by the recording arm. An accuracy within 1.5% of the scale range will be secured under all conditions of service.

In the a-c. wattmeters the dynamometer movement has been carefully formed in order that a magnetic field will result which will be uniform throughout the arc covered by the recording arm. Although the power lost in the instrument coils is extremely small, the torque is exceptionally strong and the response to changes in the circuits is very rapid. The current coils are wound for 5 amperes and the potential coils for 110 volts for use in connection with standard instrument transformers. Where desirable however, the potential coils can be wound for higher voltages, eliminating the use of transformers.

The power consumption in the coils on 110-volt service is less than 10 volt-amperes per potential element and less than 3 volt-amperes per current element. The ratio of copper to zero temperature coefficient wire is about 1 to 10, reducing the temperature error to an infinitesimal quantity. The reactance of the potential service becomes very low, due to this high ratio, so that the instruments can be used on any commercial frequency, including 133 cycles, and still retain an accuracy within 1% of the scale range. They are of course equally immune from errors due to changes in power-factor. These instruments are made for both single and polyphase service.

The general form of construction for the d-c. wattmeter is in many respects similar to the a-c. recorder. The maximum current capacity is 400 amperes. Higher current capacities are not arranged for, as they necessitate the use of external shunts, and the temperature error is necessarily too great for average commercial services, it not being possible to so wind the coils that this error is eliminated.

For the maximum current capacity mentioned, however, the Bristol recording wattmeter for direct current will be found as accurate as the a-c. recorder under average service conditions. This direct-current instrument can also be furnished in connection with three-wire systems for voltages up to 750.

The frequency recorder operates on the soft iron plunger principle, having stationary coils and movable coils. The coils are balanced and supported on exceptionally strong knife-edges. Controlling springs are not used, as the electrical forces in the coils determine the position taken by the moving system. A novel form of phase-splitter is made use of with this instrument, involving the use of a condenser and resistor in one branch and a reactance in the other branch. The coils and iron cores being relatively large, have considerable reactance, so that should the instrument be used with the common type of resistance-reactance phase-splitter, a very small motion would be had for a comparatively large frequency variation. By including the condenser in the resistance branch and balancing the circuit to resonance for the critical frequency that the instrument is to record, a very open scale is obtained. It is possible to cover the full scale by a change of three cycles.

The workmanship on the Bristol recorders is of very high grade, as it has been felt that every part must be made to very close limits of specifications in order that a very uniform accuracy, and close interchangeability of parts may be secured. The appearance of the instruments is not only excellent externally, but the interior finish as well impresses one immediately with the idea of the high character of this complete line.

Charts for the Bristol recording instruments are 6 ins. wide and the actual scale width is 5¼ ins. The full length is 90 ft., a special grade of paper being utilized. At 3 ins. per hour this length suffices for 15 days' continuous operation. As the charts are perforated on both edges, perfect tracking of the paper is assured, the guides being so arranged that the paper passes beneath the pen, presenting a very smooth and flat surface. Records are all continuously made, the pointers resting continuously on the charts. Every fluctuation in load is therefore recorded regardless of the rapidity of the changes. The ink is fed to the pen from a reservoir through a hollow counterbalanced pointer. This pen may be easily removed for cleaning. Owing to the counterbalancing screw on the pointer, this may be so adjusted that it will rest very lightly on the chart, the ink in fact feeding chiefly through capillary attraction, which avoids friction on the paper, and largely increases the possible accuracy of recording. Zero adjusters are furnished on all instruments, with the exception of the frequency recorder, to allow for any small changes in spring tension. The frequency instrument does not require a zero adjuster inasmuch as there are no control springs, the position of the pointer being entirely dependent on the electrical forces.

## Safety Panels for Safety Street Cars.

The Brooklyn Rapid Transit Co. recently placed with the J. G. Brill Co., Philadelphia, an order for 200 safety cars, which is the largest order ever given for this type of equipment. As is well known, these cars are for one-man operation and hence must be equipped with highly specialized apparatus in order to insure easy, and at the same time absolutely safe, control.

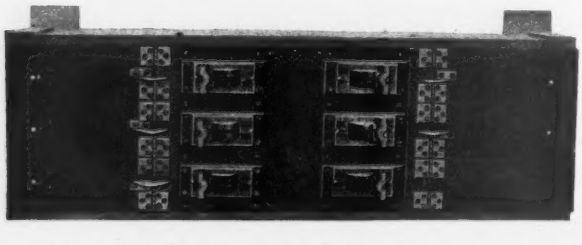
Among the interesting details of the equipment of these cars are the safety control panels, which were specially designed by the Krantz Manufacturing Co., Brooklyn. These panels are of the Westinghouse-Krantz safety type for 600 volts, somewhat similar in design to those in use in the subway cars and stations of the Brooklyn Rapid Transit and New York Municipal Railway companies.

Each panel is mounted above the vestibule window within easy reach of the operator and carries six switches controlling, respectively, the car lights, compressor, heater, headlights, buzzer, and register. Each switch is mounted in a separate compartment with a Bakelite-Micarta cover and molded asbestos composition sides which form arc shields between adjacent switches. N. E. C. fuse connections for each switch are also mounted in individual compartments.

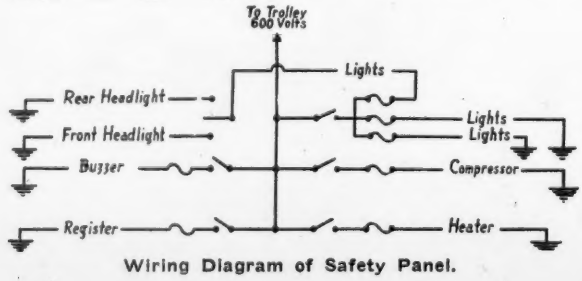
The design is such that not only is it impossible for the motorman to touch live parts when operating the switches, but the cover of each fuse compartment is so interlocked with the corresponding switch that it can be opened only when the switch is off and all accessible parts dead. Hence there is no possibility of injury in handling the panel.

The switches are of single-pole, double-break, quick-break, brush type with brushes protected by arcing tips. All are single-throw except the headlight switch, which controls the headlight at each end of the car and is therefore double-throw.

Service conditions demand that the size and weight of the panel be kept to a minimum. Its dimensions are 30½ by 10 by 4½ ins. and its weight is 45 lbs.



View of Safety Panel for Safety Street Cars.




Wiring Diagram of Safety Panel.

# Trade Activities

## Heating Device Manufacturers in Canada Combine—Westinghouse Apparatus to Equip Japanese Mill—Literature

**A. F. Daum,** Pittsburgh, Pa., is sending out a new price list on Daum refillable cartridge fuse shells for electric light and power. Various types of fuses are illustrated and briefly described as are renewal links for Types B and E fuses.

**Henry P. Thompson,** Cincinnati, Ohio, a district representative of the American Steam Conveyor Corp., Chicago, has added to his sales engineering staff Albert A. Casey, who will push the sale of the American steam jet conveyor in that territory. Mr. Casey is a mechanical engineer, a graduate of the Ohio State University and a valuable addition to Mr. Thompson's sales organization.

**Van Dorn Electric Tool Co.,** Cleveland, O., has recently completed an additional 4-story plant, providing 30,000 sq. ft. of floor space. This plant is devoted to the manufacture of portable electric drills, reamers, and grinders, which are finding greater use among automobile manufacturers and shipbuilders. Holes up to 2 ins. in diameter may be drilled in iron or steel. All parts of the machines from the motors to the cutting of the gears, through the tempering and grinding processes to an accuracy within 0.00025 of an inch, are completed in the Van Dorn plant.

**McGill Manufacturing Co.,** Valparaiso, Ind., is sending out a new circular dealing with Crescent wall guards. This is a simple device which eliminates loss from theft or breakage of lamps and is designed for use in theaters, docks, warehouses, marine work and outdoor work, where a stationary socket is used. It is strongly constructed of Bessemer steel wire ribs and stamped rings, copper plated, and is provided with key hold slots in the base ring, to make attachment and detachment easy. The circular is well illustrated and lists various types and sizes of lamp guards.

**Railway & Industrial Engineering Co.,** Pittsburgh, Pa., is distributing bulletin No. 26 on Burke horn-gap arresters and fuses of the latest types. These include the types having horn-gap arrester and choke coil with resistance in ground circuit, with reactance and resistance in the ground connection, with two choke coils for transmission lines, also horn-gap fuses, horn-gap arresters without choke coil, and several combination designs including various of these elements. Nearly all these types are not only illustrated and described, but have dimension diagrams given. A table is also included of horn-gap settings for various voltages. There are also listed separately triangular and cylindrical choke coils.

**W. E. Moore & Co.,** Pittsburgh, engineers, have been employed by the newly organized Farmers Standard Carbide Co., Freydenburgh Falls, N. Y., on the construction of its new carbide plant. This plant will be equipped with a Moore 3-phase carbide furnace, with a capacity up to 30 tons per day. The 46-ft. water fall will be developed for a capacity of 3,700 hp. Crushing, screening, can-making machinery are being designed and will be installed to correspond.

**Skinner & Eddy Corp.,** Seattle, Wash., has sold shipbuilding plant No. 1 to the Skinner & Eddy Shipbuilding Co. The former concern, after the completion of four 10,400-ton steel ships started some time ago, will cease shipbuilding operations. The new concern, which began shipbuilding last month, is controlled by H. G. Seaborn, Louis Titus, Thad Sweek, V. H. Elfendahl, M. L. Keil, George Royal and Lawrence Cunningham, with stockholders of the original Skinner & Eddy Corp. holding a minor interest.

**Taft-Pierce Manufacturing Co.,** of Woonsocket, R. I., has distributed Bulletin 110 describing its production and inspection tools. The bulletin, which is illustrated, contains 24 pages of matter that will be of interest to inspectors and machinists engaged in the production of accurately made machine parts. The tools described include taper test gages, sine bars and fixtures, "V" blocks, equalizing jaws, parallels of all kinds, rigid and adjustable knees, right angle irons, bench plates, dial indicators, squares, and boring equipment for milling machines. The Taft-Pierce company has perfected its product through the 50 years of its existence.

**General Electric Co.,** Schenectady, N. Y., has acquired the plant of the Symington Works, Leighton avenue, Rochester, N. Y., known as Plant A, for the establishment of a new local plant for the manufacture of electrical specialties. The plant provides a total floor area of about 125,000 sq. ft. of space, and during the war period was used for the production of shells for the Government. The company has plans under way for considerable expansion, and will make a number of additions to its plants in different parts of the country. At Decatur, Ill., a site has been acquired for the erection of a new plant; a 2-story and basement addition to cost about $200,000 will be constructed at the Fort Wayne, Ind., works; a large machine shop, to be equipped for all features of work, will be erected at Erie, Pa.; while at Providence, R. I., a plant has been acquired to be equipped for the manufacture of small electrical devices.

**Leeds & Northrup Co.,** 4901 Stenton avenue, Philadelphia, Pa., has issued bulletin No. 726 dealing with the White potentiometer. This instrument was designed by Dr. Walter P. White, of the Geophysical Laboratory, and includes special features for eliminating sources of error in the measurement of very small electromotive forces, especially those errors due to parasitic electromotive forces and errors due to contact resistance in the switches. The White potentiometer also provides for deflection reading of the galvanometer and for use of the instrument as a double potentiometer for testing two voltages alternately. The bulletin gives a detailed explanation of the working principle of this potentiometer, a description of the instrument, and instruction on its use and calibration.

**Westinghouse Electric & Manufacturing Co.,** East Pittsburgh, Pa., has recently received from the Imperial Steel Works of Japan an order for the first steel mill electric motor ever built for that country for a large reversing slabbing mill, with a complete set of accessory apparatus. This is the second order for electrical steel mill equipment to be received by the company from the Imperial Steel Works. The equipment is to be used with a slabbing mill with which it is expected to roll steel ingots weighing up to 25 tons, down to slabs having a maximum dimension of 17x46 ins. and a minimum of 4x20 ins. The motor will be of the double-unit reversing slabbing-mill trype, of 5800-hp. continuous capacity and 17,600-hp. momentary. It will have a speed range of 47 to 90 r. p. m. and will use direct current at a voltage of 700. Power for the motor will be furnished by a motor-generator consisting of two 700-volt direct-current generators driven by one alternating-current motor. The generators each will be of 3000-kw. capacity, and will operate at a speed of 368-r. p. m. They are to be connected in series with the reversing motor and will be designed to stand the same momentary current peaks that it does. The motor which drives the two generators will be of the 8-pole wound-rotor induction type, and will be of 6250-hp. capacity. It will take 3-phase 25-cycle, alternating-current power at 3300 volts. A 150,000-lb. cast steel flywheel is to be used with this set. It will be composed of three sections and will measure 14 ft. 9 ins. in diameter. Control for both the reversing motor and the motor-generator set will also be furnished. Another part of the equip-

ment will consist of a 3-unit exciter set consisting of two d-c. generators driven by an alternating-current motor. One generator will be of the constant-potential type and rated at 62-kw., 250 volts. The other will be series wound and rated at 37½-kw., O-250 volts. This motor will be of the squirrel-cage 3-phase, induction type and rated at 125 hp., 440 volts, 25-cycles. The speed of the set is 720 r.p.m. Oother apparatus will consist of a blower driven by a 50-hp. 440-volt, 3-phase, 25-cycle, squirrel-cage induction motor, an air washer and a 165-kv.-a. 3-phase, 25-cycle, 440-volt/3300-volt transformer for supplying the blower motor and exciter set. A pump for circulating water will also be supplied, driven by a 7½-hp. direct-current, 1200-r. p. m., 230-volt, shunt wound motor equipped with starter, and start and stop push buttons.

**Stanley W. Hull,** 3729 Prospect avenue, Cleveland, O., engineer and contractor, is sending out literature on the "Hull" extension frame, which has met with the approval of line construction superintendents in all parts of the country. In these days of advancing costs of labor and materials, this apparatus which permits of extension of pole heights to accommodate an extra circuit, is especially welcome and is gaining great favor among the superintendents of line construction. The versatility of this apparatus is demonstrated in the fact that it eliminates the necessity of replacing butt-rotted poles. By merely cutting off the old pole at the ground, resetting it and adding the Hull extension frame, the pole is restored to its original height and strength, at a saving of time, labor and material. These frames are of rugged construction, easy to handle and will fit any pole up to an eight-inch top.

**The Cutler-Hammer Manufacturing Co.,** Milwaukee, Wis., has revised and reprinted two of its standard descriptive booklets known as Booklet "A" and Booklet "S." Booklet "A" describes C-H motor-operated brakes for alternating-current service, made for application similar to the direct-current type M magnet brake, such as for cranes, elevators, mine hoists and other kinds of conveying and hoisting machinery. A recent interesting application was made on a large plate planer to prevent overtravel of the tool and consequent damage to the machine in case of failure of power or other emergency necessitating a quick stop. Booklet "S" illustrates and describes the C-H magnetic separator, which is used in 35 different industries. The three principal uses may be classified as follows: (1) Cobbing, or removal of stray iron that would injure crushing, grinding or cutting machinery; (2) recovery of iron for its intrinsic value, as found in refuse sands from foundries, garbage, etc.; (3) the purification of products. Cement plants use magnetic separators to prevent the entrance of iron or steel into the crushers and pulverizers used in crushing the rock and to prevent magnetic material from entering the coal pulverizer. The latter use is especially recommended, since it has been shown that a spark caused by iron or steel getting into the pulverizer may cause a violent explosion of a mixture of air and coal dust. More pertinent information, new engineering data, new installation views and the explanation of new uses were the primary reasons for re-editing these two interesting booklets.

**Morse Chain Co.,** with general office and works at Ithaca, N. Y., is making distribution of an attractive, gilt-edged memorandum book, 2½x 3¼ ins., neatly bound in a good quality of leather. In addition to the usual pages provided for memoranda for each day of the year, the book contains considerable valuable information. Several pages are devoted to descriptions of and data on the Morse silent-chain drive, illustrations of Morse products and views of typical installations. A table of multipliers, information on horsepower and torque, rates of postage, money orders, parcel post regulations and illumination are included as is also a list of representative hotels in the principal cities of the United States. A number of blank pages are provided for telephone numbers and memoranda. On the inside front cover page is a calendar for the year 1920 and on the inside back cover page a calendar for the year 1921.

**The Roller-Smith Co.,** 233 Broadway, New York City, maker of electrical instruments, meters and circuit breakers, announces the appointment of G. Lindstrom as works manager of its plant at Bethlehem, Pa. Mr. Lindstrom is a graduate of the Royal Institute of Technology at Stockholm, Sweden, having secured his degree of mechanical engineer in 1906 and the degree of electrical engineer in 1907. Since his graduation he has been connected with the following concerns in the capacities indicated: Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa., drafting department; Ohio Sterling Co., Dayton, Ohio, chief engineer; Electric Products Co., Cleveland, Ohio, chief engineer; S. K. F. Ball Bearing Co., Hartford, Conn., production manager, and S. K. F. Ball Bearing Co., Gothenburg, Sweden, production manager. Mr. Lindstrom's technical education and his wide and varied experience make him particularly well fitted to assume his new duties.

**Canadian Edison Appliance Co., Ltd., Organized.**—Announcement is made that on Jan. 1 the manufacturing departments of heating devices of the Canadian General Electric Co., Ltd., and the organizations of the Canadian Hotpoint Electric Heating Co., Ltd., and the Hughes Electric Heating Co., all of Toronto, Ont., were consolidated to form a new company to be known as the Canadian Edison Appliance Co., Ltd. This new Canadian enterprise will continue to manufacture the complete line of heating and cooking devices that have been manufactured in the past by the above named companies. The new company states that its purpose is to sell all the complete lines and carry on the policies of the companies in the broadest possible manner. J. R. Richardson is the managing director; F. M. Dusenberry, sales manager; F. R. Goldsmith, works manager; R. S. Morgan, secretary and treasurer, and W. P. Young, purchasing agent, all of Toronto, Ontario. Early this year the Canadian Edison Appliance Co. will open its new works in Stratford, Ont. The general offices are now situated at 25 Brant street, Toronto, Ont.

**Wheeler Condenser & Engineering Co.,** Carteret, N. J., has just revised and enlarged Bulletin No. 112-B, entitled "Condensers, Pumps, Cooling Towers, Etc." This bulletin illustrates a surface condenser containing 50,000 sq. ft. of surface. Sixteen condensers of approximately this size are now under construction. These will contain approximately 1000 miles of Crescent brand tubing drawn in the large Wheeler tube mill. The bulletin shows photographs of a number of actual installations of surface condensers. It illustrates and describes surface condensers, jet condensers, barometric condensers, the Wheeler-Edwards air pump, the Wheeler rotative dry vacuum pump, the Wheeler turbo-air pump, the patented Wheeler steam jet air pump, Wheeler centrifugal pumps for all services, jet condensers, barometric condensers, natural and forced-draft cooling towers, feed water heaters, and Wheeler's evaporators and dryers.

**The Reflectolyte Co.,** 914 Pine street, St. Louis, Mo., is making distribution of an illustrated circular, introducing a new lighting unit to be known as the "Supreme" Reflectolyte, which it is expected will be placed on the market about the first of the year. This lighting unit presents an exceptional and well-balanced appearance and embodies advanced ideas of light control and diffusion. It utilizes and controls all the rays emitted by the light source, converting them into a flood of soft, cheerful, well diffused light of a color and quality most suitable for indoor illumination. These Reflectolytes are made in a variety of styles and sizes sufficient to carry out a harmonious scheme of illumination in public and office buildings, department and retail stores, banks, hotels, churches, schools, theaters, hospitals, and wherever the maximum of illumination is required. They possess a number of new and valuable features and have been developed artistically, scientifically, and mechanically to a very high degree. One of the features of this unit is its translucent blown glass urn of beautiful outline and surface ornamentation in classic and Gothic periods, which together with the harmonizing body enhance the beauty of the most ornate interiors. A very interesting feature is its system of ventilation, whereby the cool air entering at the junction of the urn and the metal holder, rises between the body and the non-reflecting surface of the reflector and passes out in openings below the canopy. By this method any dust or dirt entering the unit will not be deposited either on the inner surface of the urn, on the reflecting surface of the reflector or on the lamp itself and at the same time providing ample ventilation for the unit.

# Current News

## *Weekly Record of Construction Activities—Conventions*

### EASTERN STATES.

**Worcester, Mass.**—Fire on Dec. 21, which caused a total loss of about $100,000, damaged the establishment of W. D. Kendall & Co., electrical supplies.

**Bridgeport, Conn.**—United Illuminating Co. will erect a power plant with an initial capacity of 75,000 hp.

**Naugatuck, Conn.**—Plans are being prepared for the erection of a 4-story, 40 by 80-ft. extension to the plant of the Naugatuck Electric Co.

**Binghamton, N. Y.**—Binghamton Light, Heat & Power Co. is arranging plans for the installation of new equipment and extensions at its plant early this year to increase the present capacity. The company has recently completed the installation of a new turbine unit at the plant, and the extension plans include the installation of another unit of this character at an early date.

**Binghamton, N. Y.**—State Hospital Commission has completed plans for the installation of new soot blower equipment at the power plant of the Binghamton State Hospital. E. S. Elwood, Capitol, Albany, is secretary of the commission; L. F. Pilcher, Capitol, is state architect.

**Buffalo, N. Y.**—Announcement has been made that plans are being arranged by the New York Telephone Co. for the installation of automatic telephones to replace the present system. It is understood that this work will be inaugurated when the new Riverside exchange in Hertel avenue is opened. E. D. Anderson is local publicity manager.

**Ludlowville, N. Y.**—International Salt Co., 2 Rector street, New York, has awarded a contract to the R. H. Beaumont Co., 315 Arch street, Philadelphia, Pa., for the construction of a large new local boiler plant. The structure, with equipment installation, will cost in excess of $200,000.

**New York, N. Y.**—Notice has been filed with the Secretary of State by the Tide Water Electric Co., 44 Park place, of an increase in its capitalization to $50,000, for proposed expansion.

**New York, N. Y.**—R. & J. Dick Co., Inc., a New Jersey corporation, has filed notice of authorization to operate in New York for the manufacture of power transmission machinery with a capital of $2,000,000. S. A. Pardee, 55 Barclay street, has been appointed to act as local representative.

**New York, N. Y.**—Charles Cory & Son, Inc., 290 Hudson street, manufacturer of electrical signaling apparatus, electrical marine equipment, etc., is making rapid progress on the construction of a new plant at 183-87 Varick street. Contract has been awarded to the New York Edison Co., Irving place and 15th street, for furnishing electric energy for the operation of the new plant.

**New York, N. Y.**—Announcement has been made that the Government of Bolivia is considering plans for the electrification of railroads throughout the country, and has declared as public domain the waters of rivers having sufficient flow to be used for power purposes.

**New York, N. Y.**—Plans have been filed by Architect W. Bosworth, 527 5th avenue, for the construction of a large new extension to the present 11-story Telephone & Telegraph building for the American Telephone & Telegraph Co. The structure will cover the remainder of the block on Broadway, between Dey and Fulton streets, and will be the same height as the existing building. The project is estimated to cost $5,000,000.

**New York, N. Y.**—Pacent Electric Co. Capital, $10,000. To manufacture electrical goods. Incorporators: H. F. Rawson, L. G. Pacent and A. H. Grebe, Richmond Hill.

**Niagara Falls, N. Y.**—Niagara Falls Power Co. has placed into operation 3 35,700-hp. units recently installed in the lower power development section of the company's properties. It is said that the company now possesses the greatest power generators in the world. John L. Harper is chief engineer of the company.

**Rochester, N. Y.**—Kellogg Manufacturing Co., 3 Circle street, has had plans prepared for the construction of a new 1-story brick heating plant at its works, about 45x58 ft., to be located on Humboldt street. The structure will cost about $15,000.

**Butler, N. J.**—Plans are under consideration by the Borough Council for the construction of a new addition to the municipal electric plant to increase the present service. The structure is estimated to cost $30,000.

**Dover, N. J.** —In connection with the construction of the proposed municipal disposal plant to be located below the Boonton dam, plans and specifications for which were recently approved by the State Board of Health, considerable electrical and mechanical equipment will be required.

**Hightstown, N. J.**—Plans are being considered by the Common Council for the purchase of the local electric light plant of the Hightstown Electric Light & Power Co. It is undestood that the works will be enlarged and new equipment installed, including new electrically operated engines for pumping at the municipal water plant.

**Newark, N. J.**—Clark & Co., 154 Rose street, are arranging plans for the construction of a new woodworking plant, to be electrically operated throughout, on property recently acquired at Rose street and Jelliff avenue. It is understood that the works will comprise a series of buildings, and when completed will be one of the largest woodworking establishments in the state.

**Newark, N. J.**—Dye Products Co., 202 Vanderpool street, has filed plans for the erection of a 1-story brick boiler plant extension to its works, to provide increased power facilities.

**Trenton, N. J.**—Plans are being prepared by the H. R. Mallinson Co., Inc., New York, for the construction of a large new power plant, to be used for the operation of the proposed new works of the company on Parker avenue, Trenton, at which location the plant of the Reeves-Cubberly Engine Co. has been acquired for the purpose. Considerable electrical equipment, including motors for individual drive, etc., will be required at the works.

**Trenton, N. J.**—In connection with the construction of the proposed large plant of the American Bridge Co., to cost approximately $1,000,000, large quantities of electrical equipment, including motors, etc., will be required. The new works, it is understood, will comprise a main building, about 200x600 ft., 1-story; pattern shop, 60x225 ft.; a new 1-story hospital building, about 40x40 ft., modern in all details; with auxiliary structures; new 200-ft. runways will be constructed, to provide for the transportation of finished material to different sections of the plant, while electrically operated traveling cranes for this feature of operation will be installed. It is planned to have the entire work completed by the coming fall, and employment will be afforded for several hundred additional persons.

**Ambler, Pa.**—Philadelphia Suburban Gas & Electric Co. is considering plans for the construction of a new 1-story brick local substation. The structure will be about 25x60 ft.

**Connellsville, Pa.**—Plans are being prepared for the erection of a power plant by the Yough Electric Co.

**Philadelphia, Pa.**—Keystone Spinning Mills, 1631 North Second street, has completed arrangements for alterations and improvements in its pumping building at Palethorp street and Columbia avenue.

**Philadelphia, Pa.**—Rumsey Electric

Co., 1231 Arch street, electrical machinery, supplies, etc., has had plans prepared for alterations and improvements in its building at 1007 Arch street, to facilitate operations. Day & Zimmerman, 611 Chestnut street, are architects.

**Pittsburgh, Pa.**—The completion of the new Springdale plant will increase the generating capacity of the West Penn Power Co. 44%. The company has under contract, together with prospective new business, more than sufficient output to keep its generating plant at Connellsville and Windsor and the new Springdale plant loaded to capacity.

**Reading, Pa.**—Metropolitan Edison Co. is arranging for the immediate construction of a new high-tension line from Reading to Hamburg to connect with the system of the East Pennsylvania Railways Co., for furnishing electric energy to the town of Pottsville.

**Reading, Pa.**—Metropolitan Edison Co. has increased its capital by $1,350,000 to cover the costs of new improvements, principally additional equipment and power transmission lines.

**Steelton, Pa.**—Plans are being arranged by the Bethlehem Steel Co. for the installation of a new motor-driven engine at its local rolling mills, to replace the present steam-operated unit.

**Trafford City, Pa.**—Westinghouse Electric & Manufacturing Co. has completed the installation of a new electric furnace at its local plant at a cost of about $200,000, and it is said that similar improvements are contemplated in other plants of the company. The completion of this furnace marks the entry of the company into the production of its own steel castings.

**Hyattsville, Md.**—Town council is considering plans for the installation of a new municipal electric light system.

**Norfolk, Va.**—Virginia Railway & Power Co., Richmond, is considering extensive improvements in its plants and equipment. It is said that the project will involve an expenditure in excess of $1,000,000. T. S. Wheelwright is president.

**Charlotte, N. C.**—Charlotte Electric Repair Co. will build a plant to cost about $60,000 and will install machinery for heavy electrical repair work.

**Guilford College, N. C.**—Board of Managers of Guilford College, which recently completed arrangements for the rebuilding of its power plant destroyed by fire, has contracted with the North Carolina Public Service Co. for the construction of a new electric transmission line, about 4 miles, extending to the institution. Dallan O'Brien, contractor, New Orleans.

**Windsor, N. C.**—City has approved a bond issue of $45,000, the proceeds to be used for the construction of a new municipal light and water system.

**Columbia, S. C.**—Southern Bell Telephone & Telegraph Co. will erect exchange. The building will be of reinforced concrete construction. Estimated cost, $205,700. A.

**Smithville, Ga.**—Plans are under consideration by the city for the construction of new municipal light and water systems. J. H. Randall, Jr., is mayor.

## NORTH CENTRAL STATES.

**Canton, O.**—Arctic Ice Machine Co. will erect a machine shop and power house. The company is in the market for steam power plant equipment and expects to purchase additional equipment.

**Dayton, O.**—Dayton Power & Light Co. will double the capacity of its Millers Ford plant. A 30,000-hp. steam turbine and 2 large boilers will be installed. It is understood that this extra equipment, with the cost of installation, will involve an expenditure of $800,000.

**Youngstown, O.**—A company to operate the first electric steel mill in the city has been incorporated with a capitalization of $1,500,000. Construction work is to be begun in February on a site between Girard and Warren streets.

**Xenia, O.**—The Civic Affairs Committee is interested in improvements to be made in the city. The specifications include additional electric lighting. Address J. Kenneth Williamson, chairman.

**Bad Axe., Mich.**—Representatives of the village and city governments of Sebewaing, Pigeon, Elkton and Bad Axe will meet to confer upon the electric light, water and power problems now confronting each of them. Pigeon particularly is quite as badly off as Bad Axe on its light and power conditions. It is expected that this meeting will discuss the possibilities of the proposition to install a central plant in Bad Axe to supply electric current to the outside towns as well as increased facilities for itself.

**Brooklyn, Mich.**—Brooklyn village council has endorsed a tentative contract for a light and power franchise presented by the Hydroelectric Development Co. at Liberty Mills. A bonding proposition for funds sufficient to cover the costs of construction necessary in wiring the town, and to include the boulevard system of lighting for the public square will be submitted by the voters at a special election.

**Columbia City, Ind.**—The municipal electric light will be enlarged, the additional equipment to be installed by Frank Schultz, city electrician.

**Converse, Ind.**—The council will offer for sale $6500 in bonds for the purchase of motors and other equipment for the water works. Address village clerk.

**Evansville, Ind.**—Elks Lodge plans erection of $50,000 living apartment to be built as addition to lodge building.

**Evansville, Ind.**—City will construct an 8,000,000-gal. clear storage well to cost $350,000.

**Greenfield, Ind.**—The municipal electric light plant has issued bonds in the amount of $6000.

**Indianapolis, Ind.**—Ace Accessories Corp. has been incorporated with capital of $10,000 to deal in electrical supplies. Those interested are: William H. Sippel, Harry W. McNeill and F. E. Sippel.

**Indianapolis, Ind.**—Vonnegut Machinery Co. will erect a new warehouse and salesroom to cost $300,000. The new building will be 95x300 ft., of reinforced concrete factory construction, with steel sash on three sides of the building.

**Indianapolis, Ind.**—N. B. Barkley will erect $50,000 building, 33x206 ft.

**Indianapolis, Ind.**—Hibben, Hollweg & Co. will erect new warehouse, 112x193 ft., either 5 or 7 stories in height, of reinforced concrete, fireproof construction.

**Kokomo, Ind.**—Pittsburgh Plate Glass Co. plans the erection of an $800,000 power plant. The company also plans the erection of 100 homes for employes of the plant.

**Syracuse, Ind.**—Syracuse Light & Power Co. and the Baltimore & Ohio Railroad Co. have approved plans for the building of a dam next spring, the project being for the benefit of the Syracuse Light & Power Co.

**Vevay, Ind.**—About $13,000 will be expended to improve the electric light system. Address city clerk.

**Bloomington, Ill.**—Meadows Manufacturing Co. has completed the first of a group of buildings, this one being the foundry building, which is 90x260 ft. The next building to be erected will be the core and pattern room.

**Chicago, Ill.**—General Combustion Co. will erect 1-story factory building to cost $60,000 and 2-story office building to cost $100,000.

**Grafton, Ill.**—At a special election it was decided that Grafton should have electric lights. Another election will probably be held in the near future to vote bonds sufficient to cover the cost of the new plant. The contemplated system will afford 24-hour service.

**Lawrenceville, Ill.**—Central Illinois Public Service Co. is planning to construct and operate a 33,000-volt electric transmission line from its Illinois terminus to Vincennes, Ind.

**Bruce, Wis.**—The sum of $12,000 in bonds has been voted for constructing a municipal lighting system.

**Green Bay, Wis.**—The city is having plans prepared for an ornamental street-lighting system in the business district. Vaughn & Meyer, Security building, Milwaukee, are the engineers.

**Benson, Minn.**—Plans for improvements to the electric light plant are being prepared. W. E. Skinner, Minneapolis, is engineer.

**Duluth, Minn.**—Minnesota Steel Co. plans the expenditure of $9,000,000 at its Duluth plant. The program will include a wire mill of large capacity, changes in various mills and additional equipment at the power plant. The company will also

erect 250 houses at Morgan Park, the company's model town site.

**East Jordan, Minn.**—East Jordan Electric Light & Power Co. will rebuild the old power dam on Deer Creek. Considerable work has been done in the way of drafting plans and making blueprints, the securing of flowage rights and option on properties. Address F. G. Balch, manager.

**Litchfield, Minn.**—The question of issuing $12,000 for improving the electric light plant will be submitted to vote. Address village clerk.

**Moorhead, Minn.**—Bonds in the sum of $6500 have been authorized for fire alarm system. Address city clerk.

**Davenport, Ia.**—Western Pump Co. plans the erection of a larger factory building.

**Dubuque, Ia.**—Dubuque voters will decide Jan. 26 the question of a municipally owned and operated electric light plant.

**Buckner, Mo.**—Buckner has voted a franchise to the Green Light & Power Co. of Pleasant Hill, Mo., to furnish light and power to the homes and business houses and install 24 street lamps. The company also furnishes power and light to Lees Summit and other small towns in Eastern Jackson county.

**Kansas City, Mo.**—Kansas City Structural Steel Co. stockholders have oversubscribed a $500,000 stock issue for plant and equipment extensions which will include a new warehouse 700x230 ft.

Poplar **Bluffs, Mo.**—M. R. Cole is now engaged looking over prospective sites for a power dam at Butting Rock, near Eminence. He estimates that a 30-ft. dam located at that point would be capable of furnishing electricity for all power requirements in this section. An unlimited supply of water power is one of the natural resources of the Ozark region.

**St. Louis, Mo.**—Federal Reserve Bank will erect a $2,000,000 banking house on Locust street, between Broadway and Fourth street.

**St. Louis, Mo.**—Bridge & Beach Manufacturing Co. has completed plans for the erection of a plant, which will embrace all modern improvements in industrial construction. The plant will consist of a molding shop, 150x322 ft., a cleaning and grinding building, polishing and nickeling building, japanning room, a 3-story mounting building, 54x118 ft. and a 3-story warehouse, 120x255 ft. A center group of buildings will comprise the boiler house, engine house, enameling building, pattern storage building and pattern shop. The entire plant will be electrically operated from power generated at the plant.

**Canton, Kan.**—Election to vote $18,000 in the electric light bonds and $37,000 waterworks bonds carried.

**Harper, Kan.**—A petition has been started for a white way system on the principal business streets.

**Larned, Kan.**—Electrical Development Co. has been organized to promote the sale of electrical irrigation equipment and construction of needed transmission lines. Paul Margolis, president; N. I. Lupfer, vice-president; J. S. Vernon, secretary; H. L. Read, treasurer; N. L. Jones, consulting engineer.

**Neodesha, Kan.**—A white way on Main street is contemplated. If the proposition carries work will begin some time in the spring.

**Onaga, Kan.**—The board of county commissioners is having plans made for the installation of a lighting system at the county home. Bids will be advertised soon.

**Solomon, Kan.**—Election to vote $75,000 bonds for the installation of waterworks system carried.

**Topeka, Kan.**—Application for certificate of authority to do business was filed by the Morris County Light & Power Co. This is a new concern which will furnish electric light and power to Council Grove and adjacent towns.

## SOUTH CENTRAL STATES.

**Louisville, Ky.**—Power and light plants and other utilities will be installed by the Country Home Power & Light Co., which has applied for a charter with a capital stock of $30,000.

**Uniontown, Ky.**—In connection with the installation of a new coal mining plant by the Union County Mining Co. for the development of approximately 4000 acres of coal lands, considerable electrical equipment and power plant apparatus will be required.

**Knoxville, Tenn.**—People's Telephone & Telegraph Co. will improve its plant and install cable lines. Its capital will be increased from $120,000 to $200,000.

**Gadsden, Ala.**—Gadsden Pipe Co. will build a 1-story foundry, 25x500 ft., with installation to include a 90-in. cupola, motor-driven blower, etc.

**Gadsden, Ala.**—Gulf States Steel Co., Birmingham, has awarded contracts for the installation of new electrical equipment at its local plant, to increase the present capacity from 3000 to 7000 kw. New condensers will also be installed, while a new pumping station and distribution pipe lines will be constructed.

**Montgomery, Ala.**—Plans are in process of formation by the Montgomery Light & Water Co. for extensive additions to increase its present capacity. The proposed work will include the construction of a new transmission line to connect with the Alabama Power Co. at Vida, of 44,000-volt high-tension capacity; the entire project to cost about $500,000. The company is under the management of the Cities Service Co., New York.

**Tallahassee, Ala.** — Montgomery Light & Water Power Co., Montgomery, is considering plans for the rebuilding of its hydroelectric plant dam recently destroyed by floods. The proposed work will cost in excess of $500,000. S. B. Irelan is general manager.

**Lexington, Miss.**—The city will sell $20,000 electric light plant bonds. Address W. W. Milburn.

**Lafayette, La.**—Plans are under consideration by the city trustees for improvements and extensions in the municipal light and water plants.

**New Orleans, La.**—New Orleans Railway & Light Co. is arranging for extensions and improvements in its main power house to increase the present capacity. John S. Bleecker is general manager.

**Ft. Smith, Ark.**—Ft. Smith Light & Traction Co. contemplates the erection of an addition to its plant to cost $250,000.

**Harrisburg, Ark.** — Harrisburg Light & Power Co. has completed arrangements for the erection of three new brick and concrete structures at its plant, about 65x65 ft., 36x53 ft., and 40x65 ft., respectively. It is proposed to install electrical machinery to cost about $30,000, as well as ice manufacturing equipment estimated to cost $20,000, to have a capacity of 10 tons of ice daily. New generating equipment will also be installed. Fairbanks-Morse Co., Baltimore, Md., is the contractor; Memphis Engineering & Supply Co., Memphis, Tenn., is engineer for the company.

**Little Rock, Ark.**—Permission has been given to Moody & Lewis to erect a transmission line and an electric generating plant near Stuttgart. They were denied authority to place their line within 5 miles of the Arkansas Light & Power Co.

**Madill, Okla.**—Election has been called for Jan. 15 to vote $400,000 in bonds for waterworks extension. The issue provides for the erection of a dam on Mill Creek 11 miles north of the city, with a 12-in. main into the city, engines, water tanks, towers and all necessary machinery and equipment for furnishing water. Johnson & Benham, consulting engineers, Firestone building, Kansas City, Mo.

**Bonham, Tex.**—J. T. Holcomb, of Sherman, Tex., and associates are promoting the construction of an interurban electric railway between Bonham and Greenville, a distance of about 40 miles. The route of the proposed line is through a territory that is now some distance removed from railroad transportation facilities. It would give Bonham an outlet to the south and a direct line into Dallas. It is stated that considerable progress has been made in the preliminary plans looking to the building of the proposed line.

**Ft. Worth, Tex.**—A proposition is now under way to install numerous new street lights on Commerce street and convert it into a white way after it is repaved.

**Ft. Worth, Tex.**—Plans for the erection of a new plant by the Ballard-Martin Electric Co. have been completed. The new building, which will be devoted to the manufacture of electrical equipment, will cost about $100,000.

**Gainesville, Tex.**—According to Burt C. Blanton of Dallas, vice-president and general manager of the Sherman & Gainesville Traction Co., preliminary plans for the construction of an interurban electric railway between Gainesville and Sherman, about 35 mi., have been fin-

ished, and work on the grade will be started in February. George M. Easley, of Dallas, is president and J. Dabney Day, of Dallas, is treasurer of the company. Henry E. Elrod, of Dallas, is supervising engineer and Shearon A. Bryan, of Gainesville, assistant general manager and secretary. The proposed route over which the interurban will be built runs in a north-easterly direction from Gainesville, through the town of Callisburg, thence through Whitesboro, and from there the route will parallel the Missouri, Kansas & Texas Railroad to Siler. From that place the route is in a southeasterly direction, probably including the town of Southmayd, and thence into Sherman. The company is considering the extension of its proposed line west from Gainesville. at a future date for the purpose of tapping the proposed Dallas-Wichita Falls interurban at a point of Montague county.

**Goose Creek, Tex.**—Two large electric power stations and transmission systems are to be constructed in the Goose Creek oil field. It is announced by the Gulf Production company that its proposed plant will furnish electric power for operating the pumps of all of its oil wells in this field, and that the cost of the plant, power lines and motors will be approximately $500,000. The Humble Oil & Refining Co. has taken steps to construct a similar plant and transmission lines for the purpose of pumping the oil of its wells. The improvements which it purposes to make will also cost about $500,000, it is stated. It is probable that drilling wells by electric power will be adopted by these two companies. It is stated that this method is in successful use in California and Kansas. It is to be adopted soon by a number of companies that are operating in the Burkburnett field.

**San Jose, Tex.**—A new plant will be erected by the Stroud Manufacturing Co. which, including equipment, will cost about $550,000.

**Wichita Falls, Tex.**—Authorization to order the installation of 300 additional incandescent street lights has been granted by the city council.

## WESTERN STATES.

**Libby, Mont.**—H. E. Robinson, manager of the Libby Water & Electric Co., received assurance from the board of directors of the Libby company that extensive repairs and improvements are to be made in the equipment of the company next spring, designed to bring Libby's power and light service up to a standard that will be excelled by no other Montana city.

**Ryegate, Mont.**—Montana Power Co. will install a substation in Ryegate to furnish the city with electricity. Construction of a white way lighting system is now being taken up by the local civic authorities.

**Camas, Wash.**—Camas Water Co. has ordered and will install a 4-stage Byron Jackson pump with a capacity of 550 g. p. m., to be operated by a 50-hp., 1200-r. p. m. motor, against a head of 220 ft., discharging into tank and mains.

**Centralia, Wash.**—Plans are under consideration by the Washington Light & Power Co. for the construction of a new local electric light and power plant.

**Mukilteo, Wash.**—Mukilteo & Seaview Improvement Clubs propose power and light service improvements in the city.

**Olympia, Wash.**—Plans for the Snake river irrigation project, for which complete preliminary survey has been made by the State Reclamation Service during the past summer, call for irrigation of 60,000 acres in Franklin county and 40,000 acres in Walla Walla county by means of large pumps to be operated with power generated from the dam.

**Tacoma, Wash.**—Tacoma Railway & Power Co. has given notice of an increase in street car fares to 10 cts. beginning Jan. 18. The new rate was filed with the state public service commission together with a statement as to its necessity. It was declared that the present fare, seven cents, does not bring in sufficient revenue to meet operating expenses and the condition of the system was pictured as being in a bad state.

**Portland, Ore.**—North Portland Box Co. will rebuild its plant, recently destroyed by fire, for larger capacity. The machinery will be electrically operated.

**Roseburg, Ore.**—Douglas County Light & Water Co. is rebuilding its pumping plant for furnishing a greater water supply for the city system, and has ordered two 4-stage Byron Jackson high-head pumps of the capacity of 1500 g. p.m., to operate against a head of 330 ft., to discharge directly into the water mains. Each pump is driven by a 100-hp. motor, the entire equipment having been sold through A. P. Dumond, Portland, Ore.

**Manteca, Cal.**—The city engineer will prepare data for the purpose of a bond issue soon to be made for public improvements. These include a lighting system for Yosemite avenue and 2 blocks of Hogan road, a storm sewerage system, a curb line and grades for sidewalks.

**San Francisco, Cal.**—Coast Valleys Gas & Electric Co. will improve its service between Salinas and Kings City by the construction of a transmission line.

## PROPOSALS

**Generators.**—Bids will be received until 3 p. m., Jan. 26, by Chairman Committee on Fire, Water, Light and Power, Winnipeg, Canada, for the supply, delivery and erection of foundations supplied by the corporation of its power house, Point Du Bois, of 2 3-phase generators for direct connection to double reaction turbines and for spare parts for same; also one additional or extension set, ordered furnished and installed. C. J. Brown, city clerk.

**Waterworks Improvements.**—Bids will be received Jan. 20 for waterworks improvements in Lexington, N. C. The work will include a brick and concrete pumping station, filterhouse and filter tubes; 3½ miles of 2200-volt transmission line, and motor-driven pumps and accessories. Address J. T. Hedrick, mayor. Gilbert C. White, engineer.

## INCORPORATIONS

**New York, N. Y.**—Magnus Electric Co. Capital, $10,000. To manufacture electrical goods, etc. Incorporators: L. S. Shiro, M. E. Comerford, and M. Manheim, 520 West 144th street.

**New York, N. Y.**—Gold-Clar Brass & Electrical Supply, Inc. Capital, $15,000. To manufacture electric fixtures, etc. Incorporators: I. and R. Clar, and H. Goldberg, 219 Grand street.

**Newark, N. J.**—Stein International Power Co. Capital, $500,000. To manufacture electric power machinery, etc. Incorporators: Samuel P. Stein, Samuel G. Klaus, and H. P. Grant.

**Allentown, Pa.**—Allentown Cable & Machine Co. incorporated under Delaware laws. Capital, $150,000. To manufacture cables, engines, parts, etc. Incorporators: Albert S. George, Philadelphia; Arthur J. Frankenfield, and Oscar G. Tillman, Allentown.

## FOREIGN TRADE

*[Addresses of firms referred to in these trade opportunities may be obtained by writing to the Bureau of Foreign and Domestic Commerce, Washington, D. C., or its branch and local co-operative offices. Request for each opportunity should be on a separate sheet and the file number given.]*

**Electrical Machinery** (31,627).—The purchase is desired by a man in Brazil of machinery for a sugar mill, electrical machinery for soda ash manufacture, machinery for the manufacture of rubber articles, for a paper plant, for preparing sulphuric acid, and for the manufacture of alcohol. Quotations should be given c. i. f. Brazilian port. Correspondence may be in Portuguese or Spanish. Catalogs and price lists are requested. Reference.

**Electrical Apparatus** (31,592).—A civil engineer in Sweden desires to secure an agency for the sale of agricultural machinery and implements, electrical apparatus, hardware, machinery, tools. References.

**Electrical Equipment** (31,593).—A representative of American exporters, established in Denmark, desires to take over the agency of several additional lines for sale in the Scandinavian countries, Finland, Poland, Letland, Esthonia, and Russia, of general merchandise, machine tools, railroad and contractors' equipment, electrical equipment and household appliances for cooking and heating. References.

# Personals

## I. F. Baker Becomes Special Representative of Westinghouse Interests in Japan—F. O. Wells Resigns—Changes

J. S. McCULLOH, New York City, has been elected vice-president in charge of public relations and commercial work of the New York Telephone Co.

G. A. RICHARDSON, transportation manager of the Philadelphia Rapid Transit Co., Philadelphia, Pa., has been appointed vice-president in charge of operations.

L. L. STONE, chief engineer, Pike Light & Power Co., Pikesville, Ky., has become chief engineer of the Peerless-Elkhorn Coal Co., with headquarters at Elkhorn City, Ky.

E. J. BARRY, electrical engineer, Tacoma, Wash., has designed and is supervising the installation of new electrical equipment in the mill of White River Lumber Co., at Enumclaw, Wash. The new unit comprises one General Electric 2000-kw. turbogenerator, 3600 r.p.m., 2200 volts, and a 100-kw. auxiliary generator for lighting service. The company is already provided with boilers of sufficient capacity to operate the new unit.

I. F. BAKER of the Westinghouse Electric International Co., who has been located in the New York office of that Co. for the past 2 years, is now on his way to Tokio, Japan, where he will act as a special representative of the Westinghouse International Co. Mr. Baker entered the graduate student course about 1908, later serving in various capacities in the resale and contract sections of the sales department. In 1913 he was transferred to the foreign department, which later became the Westinghouse Electric International Co. Mr. Baker has many friends in the Westinghouse company as well as in the International company and will carry with him their best wishes for success in his new field.

FRANK O. WELLS has resigned as president and director of the Greenfield Tap & Die Corp., Greenfield, Mass., and is succeeded as president by Frederick H. Payne, formerly vice-president, to whom he has disposed all of his company holdings. F. G. Echols, vice-president of the company, has been elected a director to fill the vacancy occasioned by the retirement of Mr. Wells, who will remain with the company in an advisory capacity. Mr. Wells is one of the most prominent men in the screw thread industry and he has given considerable time and study to its standardization. He was born in Shelburne Falls, Mass., Jan. 6, 1855, and received his education in the common schools and at Petersham academy. In 1876 with his brother he organized the Wells Brothers Co. This organization was later merged with the Wiley & Russell Manufacturing Co., forming the Greenfield Tap & Die Corp., of which Mr. Wells became and remained president until his recent resignation.

HUGO E. EISENMENGER, the author of the series of articles on "Central-Station Rates in Theory and Practice," which is well known to our readers as it appeared throughout our entire last volume, has accepted a position as consulting engineer for electrochemical work with the Carus Chemical Co., of LaSalle, Ill., after having served till now in a similar capacity with the Matthiessen & Hegeler Zinc Works of the same city. Mr. Eisenmenger, a native of Vienna, was formerly connected with the National Lamp Works of General Electric Co. for 10 years and before that he was engaged in design, construction and operation of central stations and electric railroads in various countries of Europe, Africa, and Asia, as well as in the electrical export business. Many of Mr. Eisenmenger's numerous articles which were printed in the ELECTRICAL REVIEW and other American and foreign electrical papers deal with central-station rates, culminating in the above named serial.

H. E. Eisenmenger.

This serial has attracted so much favorable attention and comment that the Electrical Review Publishing Co., has decided to republish these articles in book form. The book is being prepared for printing now and will come out in the near future. In its theoretical part, Mr. Eisenmenger's book brings out a number of entirely novel mathematical aspects of various rate problems which have never before been investigated in a clearcut and entirely satisfactory manner (such as the influence of the off-peak load on the demand charges or the effect of the "value-of-service" theory on the prices, etc.). The book further gives a thorough description of present rate practice for the practical man and original methods of visualizing the meaning of a given practical rate schedule, showing how the ignorance of these methods has sometimes led even rate experts to the construction of preposterous rates which on the surface looked perfectly correct. The mathematical portions of the book will be kept entirely separate from the practical portions in order to make the book equally readable for the mathematically inclined engineer as for the purely practical or commercial central-station man. In spite of the advanced and novel investigations it contains, the book is laid out in such a way that even the beginner can read it with profit and he will find fundamental explanations in certain parts of the book which are marked well off from the rest so that the advanced student and the expert can easily skip them, just as the beginner can, if he wants to, easily omit the advanced portions of the book without losing the context.

JOHN H. ALLISON has joined the Pittsburgh sales engineering department of the Celite Products Co., New York, producer of insulating products. Mr. Allison is a graduate of the mechanical engineering department of the University of Pittsburgh and has been associated with the Crucible Steel Co. of America, Pittsburgh Valve Foundry & Construction Co., Pierce-Arrow Motor Car Co., Model Engine Co., Pittsburgh; American Brake-Shoe & Foundry Co., Erie, Pa., and the Pittsburgh Bridge & Iron Co.

H. A. DREW, who is manager of the branch office established in Minneapolis, Minn., a few weeks ago by the Edison Storage Battery Co., graduated from Armour Institute of Technology in 1913. After two years in the engineering department of the Commonwealth Edison Co., Mr. Drew entered the service department of the Chicago branch of the Edison Storage Battery Co., resigning in 1917 to become associated with the Morgan-Gardner Electric Co., Chicago. After a year in the service, he returned to his old position in the Chicago branch of the Edison Storage Battery Co., leaving last November to establish the branch at Minneapolis. The new office is at 628 Security building, and the territory handled from it will include Minneso, North and South Dakota, Montana, and Manitoba.

### Obituary.

FREDERICK A. BRAINERD, vice-president and secretary of the Ingersoll-Rand Co., New York, died recently at his residence, 274 Summit avenue, Mount Vernon, N. Y. Mr. Brainerd was in his 59th year.

# Financial News

## Annual Review of Byllesby Activities.

In the opinion of H. M. Byllesby & Co. the year 1920 will witness continuation of the present commercial prosperity, marked by an industrial expansion and construction activities.

During 1919 H. M. Byllesby & Co. lodged its large engineering and management business in a distinct but closely allied organization—the Byllesby Engineering & Management Corp.—and extended its scope as an investment house underwriting and dealing in diversified securities, including the financing of industrial enterprises. In addition to the New York offices, branches were acquired in Boston, Providence, Madison, Wis., and Evansville, Ind.

The year witnessed the firm's entry into the oil business, in the acquirement, through Standard Gas & Electric Co., of the majority common stock interest of Shaffer Oil & Refining Co. The latter is a complete petroleum organization with large production, much undeveloped acreage in Oklahoma, Kansas, Texas and Louisiana, and a modern refinery and distributing facilities. The operations of the company will be greatly enlarged during 1920.

In the past the Byllesby interests have been identified with the financing, development and management of electric and gas companies, particularly the former. All of the companies will be conducted broadly, as in the past, as subsidiaries of Standard Gas & Electric Co. Their record during the war was highly creditable from the standpoint both of the investor and the consumers served in the 460 cities and towns with 2,200,000 population in 16 states. These companies in 1918, by means of additional volume of business and rate increases, held their net earnings about even with the preceding year, despite unprecedented advances in operating expenses.

In 1919 the volume of business done by this group of properties continued to increase rapidly and there was a pronounced gain in both gross and net earnings. For the 12 months ended Oct. 31, 1919, the combined utility subsidiaries of Standard Gas & Electric Co. (not including Shaffer Oil & Refining Co.) reported as follows:

| | 1919. | 1918. |
|---|---|---|
| Gross earnings | $26,504,601 | $22,437,432 |
| Net earnings | 9,764,302 | 8,614,980 |

Indicating the growth of business during the past five years, comparisons of earnings for the same group of companies, which serve Minneapolis, St. Paul, Louisville, Oklahoma City, Pueblo, San Diego, Stockton, Tacoma and many other cities, with the 12 months ended Oct. 31, 1914, are interesting.

| | Gross utility earnings. | Net utility earnings. |
|---|---|---|
| Year ended October, 1919 | $26,504,601 | $9,764,302 |
| Year ended October, 1914 | 14,264,655 | 6,635,553 |
| Increase | $12,239,946 | $3,128,749 |

During the war and reconstruction periods the customer-ownership, or home financing, policy which the Byllesby companies popularized, proved invaluable as a method of supplemental financing for additions and extensions to the properties. The improvements enabled the taking on of large quantities of new business, and the latter made it possible to increase earnings. In the meantime the original purpose of customer-ownership—the bettering of relations with the public—has also been successful.

During the single year of 1919, up to and including Dec. 24, Byllesby companies sold $3,220,000 of their preferred stock direct to their customers, the number of sales for the year being 5,356, or an average of a little over six shares to an investor. Compared with 1918, this is an increase of 47% in the volume of stock sold and 24% in the number of purchasers.

The volume of service now demanded from the electric companies is crowding generating and transmission capacities to the limit. This means a large amount of construction during 1920. At the Byllesby properties not far from 85,000 hp. additional in steam turbine generating equipment is to be installed.

Well managed electric and gas companies have amply proven their stability under the most extraordinary conditions, their ability to confine increases in selling costs to a much smaller margin than the increased prices of commodities and wages, their power to obtain new capital for enlargements and their title to the full confidence of the investor. They also bear the distinction that no charge of profiteering can successfully be brought against them.

## People Own Most of the Utilities.

Carl D. Jackson, chairman of the Wisconsin Railroad Commission, in the San Bernardino Index, is quoted as saying:

"The actual ownership of most public utilities is by the people themselves. The first liens on most public utilities are very often owned by trust companies, banks, and largely by insurance companies throughout the United States. Nearly every man carries an insurance policy. The average citizen has a bank account, yet not one citizen out of a hundred realize that in one form or another his actual savings and insurance and his wife's and children's welfare depend upon the solvency and continued operation of public utilities. There is probably not one man in fifty whom we meet on the street who does not own a part of a public utility, whether he knows it or not. So the questions relating to public utilities are not confined to the consumers on one side and the public utilities as such on the other, but the whole question is one involving financially nine-tenths of the entire population. Furthermore, public utilities should not only be solvent in themselves, but there should still remain a reasonable incentive to reasonable development along the lines to be demanded by future generations. Nothing should take place in this country to discourage individual and collective efforts along progressive lines."

## Electric Railway Situation.

A pamphlet entitled "What Is to Be Done with Our Electric Railways?" compiled by the Interborough Rapid Transit Co. from statements made before the Federal Electric Railways Commission in Washington, D. C., lists the facts in the traction situation as follows:

1. Rise in prices. Materials for service have risen between 1916 and 1918 an average of more than 100%.
2. Wages have risen since 1916 about 120% and are still going up.
3. Size of industry. Capital about $6,000,000,000. Employs about 300,000 men. 44,000 miles of track.
4. New capital needed for extensions and improvements about $700,000,000 a year.
5. Service rendered. The electric railways of the United States carry ten times as many passengers as the steam roads.
6. Losses to investors. Shrinkage of security values has already cost investors hundreds of millions of dollars. They will invest no more under present conditions.
7. In New York State. More than a billion and a quarter dollars of electric railway investment is in peril in New York State alone.

The conclusion drawn from these facts is that the industry cannot survive without increased income. A very important part of it must have relief at once.

WEEKLY COMPARISON OF CLOSING-BID PRICES OF SECURITIES OF LEADING ELECTRICAL COMPANIES.

Quotations furnished by F. M. Zeller & Co., Rookery Bldg., Chicago.

| Public Utilities. | Div. rate. Per cent. | Bid Dec. 23. | Bid Dec. 30. |
|---|---|---|---|
| Adirondack Electric Power of Glens Falls, common | 6 | 15 | 13 |
| Adirondack Electric Power of Glens Falls, preferred | 6 | 76 | 80 |
| American Gas & Electric of New York, common | 10+extra | 118 | 120 |
| American Gas & Electric of New York, preferred | 6 | 38 | 39 |
| American Light & Traction of New York, common | .. | 180 | 204 |
| American Light & Traction of New York, preferred | 6 | 91 | 90 |
| American Power & Light of New York, common | 4 | 63 | 65 |
| American Power & Light of New York, preferred | 6 | 73 | 73 |
| American Public Utilities of Grand Rapids, common | .. | 7 | 8 |
| American Public Utilities of Grand Rapids, preferred | 7 | 21 | 20 |
| American Telephone & Telegraph of New York | .. | .. | 96 |
| American Water Works & Elec. of New York, common | .. | 2 | 2 |
| American Water Works & Elec. of New York, particip | 7 | 4 | 4 |
| American Water Works & Elec. of New York, first preferred | .. | 35 | 35 |
| Appalachian Power, common | .. | 3 | 3 |
| Appalachian Power, preferred | 7 | 20 | 22 |
| Cities Service of New York, common | +extra | 405 | 400 |
| Cities Service of New York, preferred | 6 | 72 | 70 |
| Commonwealth Edison of Chicago | 8 | .. | 106¾ |
| Comm. Power, Railway & Light of Jackson, common | .. | 19 | 14 |
| Comm. Power, Railway & Light of Jackson, preferred | 6 | 39 | 39 |
| Federal Light & Traction of New York, common | .. | 7 | 7 |
| Federal Light & Traction of New York, preferred | .. | 41 | 41 |
| Illinois Northern Utilities of Dixon | 6 | .. | .. |
| Middle West Utilities of Chicago, common | 2+extra | 20 | 20 |
| Middle West Utilities of Chicago, preferred | 6 | 43 | 41 |
| Northern States Power of Chicago, common | .. | 63 | 60 |
| Northern States Power of Chicago, preferred | ex.div.7 | 89 | 88 |
| Pacific Gas & Electric of San Francisco, common | .. | 60 | 60¼ |
| Pacific Gas & Electric of San Francisco, preferred | 6 | .. | .. |
| Public Service of Northern Illinois, Chicago, common | 7 | 75 | 75 |
| Public Service of Northern Illinois, Chicago, preferred | 6 | 85 | 85 |
| Republic Railway & Light of Youngstown, common | 4 | 10 | 12 |
| Republic Railway & Light of Youngstown, preferred | 6 | 40 | 40 |
| Standard Gas & Electric of Chicago, common | .. | 27¼ | 27¼ |
| Standard Gas & Electric of Chicago, preferred | 6 | 40¼ | 41 |
| Tennessee Railway, Light & Power of Chattanooga, common | .. | 2 | 2 |
| Tennessee Railway, Light & Power of Chattanooga, preferred | 6 | 6 | 5 |
| United Light & Railways of Grand Rapids, common | 4 | .. | 25 |
| United Light & Railways of Grand Rapids, preferred | 6 | 57 | 57 |
| Western Power of San Francisco, common | .. | 20 | 20 |
| Western Union Telegraph of New York | extra | 87⅛ | 87⅛ |
| **Industries.** | | | |
| Electric Storage of Philadelphia, common | 4 | 132 | 135 |
| General Electric of Schenectady | 8 | 169 | 169½ |
| Westinghouse Electric & Mfg. of Pittsburgh, common | 7 | 53⅜ | 54¼ |
| Westinghouse Electric & Mfg. of Pittsburgh, preferred | 7 | .. | .. |